

Owners' Reports: DODGE, OLDSMOBILE

POPULAR MECHANICS

MAR. 1965
35 CENTS

**Quick-Build PM's
\$25 SPEEDBOAT** ➔

Choosing the Perfect Prop

NEW Outboard Fuel Cuts Cost 60%
Bottom Finish Speeds Getaway

Preventing Outboard Conk-Outs

**Why Car Wheels Fall Off
And How to Prevent It**

**Fresh Ideas for
Relaxed Home
Owning**

**Short Cuts
To Easy
Dovetailing**

Fast-Growing Tabletop Gardens



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clear bottle of distinctive
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that's unequalled, unquestioned
... unchanging!





**A howitzer with windshield wipers.
The new Buick Skylark Gran Sport.
400 cu. in./325 bhp.**

There is mounting evidence that our engineers have turned into a bunch of performance enthusiasts.

First they stuff the Wildcat full of engine. Then the Riviera Gran Sport. And now this, the Skylark GS, which is almost like having your own, personal-type nuclear deterrent. We've just turned it loose on our dealers. (See the Buick dealers run.)

Aside from all those cubic inches and horses and 445 lb-ft of torque, just what is this thing that our engineers have unleashed?

It's a pretty sophisticated suspension package, for one thing: Heavy-duty springs and shocks, plus a stabilizer bar that's about twice as stiff as the normal Skylark's. Axle wind-up is snubbed by heavy-duty upper control arm bushings.

It's also a floor-shift 3-speed, with all forward gears synchronized. Dual exhausts. A reinforced convertible frame to handle all that extra torque. 7.75x14 tires. All standard equipment.

Want to go the 4-speed route? There's a close-ratio unit available. Axle ratios? They read like this—2.78, 3.08, 3.23, 3.36, 3.55, and 3.73:1.

Well, there's some of the evidence. Performance enthusiasts, that's what they are.

More power to them.

**The Buick Skylark
Gran Sport**

Ronson introduces the

(Complete with large-

Burns for hours on butane gas. Adjusts from pinpoint to



STARTS LOG FIRES.



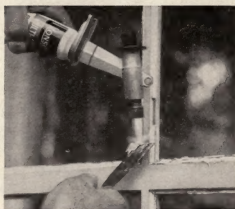
MELTS ICE.



STARTS CHARCOAL FIRES.



REMOVES PAINT.



SOFTENS PUTTY.



FOR HARD-SOLDERING METALS
SUCH AS THIS METAL CHAIR.

O.K. You own a hammer, a chisel, a screwdriver—a lot of good, hardworking tools.

So when something at your house needs fixing, you're ready, willing and able to go to work.

Or are you?

Ever try to thaw a frozen water pipe with that hammer?

Or unstuck a cracked floor tile with that screwdriver?

Or chip ice off the front steps with that chisel?

Humiliating, isn't it?

(Not having the right tool at the right time can make you feel about as self-sufficient as an old-maid schoolteacher fixing her first flat tire.)

But now Ronson has a new torch that can do all those

things. And more.

You don't have to be a handyman to put it to work. It starts charcoal and log fires quickly. It burns leaves and caterpillar nests. You can even use it to put a nice brown meringue on Baked Alaska!

It weighs less than 13 ounces. Much smaller than other leading torches, it takes very little storage space. It's as compact and easy to handle as a flashlight.

A blast from this torch can spot-kill a weed faster than you can yell "Crabgrass!"

A broken wire fence needs mending?

This torch can do a perfect soft-solder job in less than a minute.

It can hard-solder a 1/2" copper tube to a brass elbow in just a few minutes.

It can help remove old paint.

Softened old putty.

Fix a kid's toy.

Help refinish furniture.

Sweat copper tubing.

(Whew!)

Loosen rusted pipe fittings and connectors. (Just try to get in and around pipes and fittings with a larger torch.)

Free frozen nuts and bolts.

And even stand up like a laboratory burner.

(This comes in handy when you need both hands free.)

How did Ronson put this new torch together?

We used butane gas, and the

Varaflame Torch. \$4.95*.

size butane Multi-Fill.)

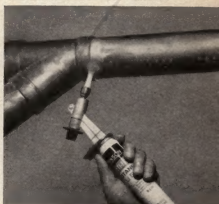
blow torch flame. Lightweight. Compact. Easiest to handle.



BURNS OUT WEEDS
AND CATERPILLAR TENTS.



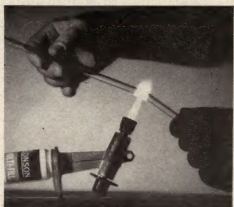
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same Ronson Multi-Fill® injector that fuels our gas lighters.

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A fingertip knob controls the flame precisely. You get the bluest flame possible. The steadiest pinpoint flame. (The steadier and bluer the flame, the more intense the heat, the faster the job gets done.)

And you won't have to take this torch apart to clean it between jobs. It's completely self-

cleaning. It just won't clog.

Now.

Where can you get your hands on the new Ronson Varaflame Torch?

Anywhere hardware is sold. The price, complete with large-size, 76 gram Ronson butane Multi-Fill injector, just \$4.95.*

Isn't that a small price for this amazing torch?

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Varaflame
Butane Torch



POPULAR MECHANICS®

MARCH 1965

VOL. 123

NO. 3

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INTERNATIONAL EDITIONS • AUSTRALIAN • SPANISH • CARIBBEAN • FRENCH • DUTCH

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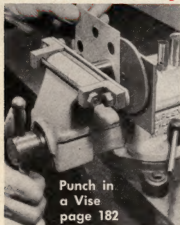
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NEXT MONTH: Build a Patio Garage plus eight additional home-brightening projects from complete plans in a special issue emphasizing your house. Also in April PM: steam cars stage a comeback, how scientists are fighting tornadoes, what owners say about their new Falcons. To top it off, you can learn how to flycast in 60 minutes

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I don't know of any scientific way to pick the right heat range spark plugs that beats the old cut-and-try method. Engines vary. So do driving conditions. Plugs that work fine in one engine just won't hack it in another one that came off the same line!

We start with the heat range recommended by the manufacturer. We run for a while and yank the plugs. When you're running hard, you're apt to need cooler-than-normal plugs—especially with a modified engine. Fused deposits, fast electrode wear and cracking at the insulator nose indicate plugs that are too “hot” for the engine and driving conditions.

If you run across this, try plugs one step colder . . . they have insulators with shorter noses and are assembled deeper in the plug shell. They run cooler because they throw heat off to the cooling system faster. Generally, the coolest plugs you can run without fouling give you top performance.

Heavy oily deposits mean you need plugs with longer noses that run hotter to burn off those deposits. No matter what kind of plugs you run, don't just stick 'em in and forget 'em! They should be cleaned and gapped every 3,000 to 5,000 miles—and replaced at about 10,000.

And when you buy spark plugs, get Autolites. I use 'em racing and in my family car and plane. Autolite makes its passenger-car plugs with the same copper and glass seals used in racing plugs. It costs a bit more, so some companies don't bother. Autolite thinks the extra efficiency you get is worth it. So do I.

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HERE IS A PARTIAL LIST OF RODGER WARD'S RACING ACCOMPLISHMENTS: Indianapolis 500—Winner, 1962, 1959; 2nd, 1964, 1960; 3rd, 1961; 4th, 1963. USAC National Champion, 1962, 1959. Winner of 25 USAC National Championship events, including 1963 Hoosier 100, Milwaukee 100, Sacramento 100; 1962 Trenton 150, Milwaukee 200, Syracuse 100, and many others.

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Over the Editor's Desk

Hydro Dynamic

I spent the spring and summer of 1963 building *Hydro Dynamic* (page 144, March 1963 PM) and got it into the water in 1964.

The entire hull is fiberglassed. I used



half-inch plywood on the bottom instead of $\frac{3}{8}$ -inch and $\frac{3}{4}$ -inch in the transom instead of $\frac{1}{2}$ -inch.

With my 40-horsepower motor, it will go 28 m.p.h. with four persons aboard. It performs like a champ in every way.
Hamilton, Ohio

LOUIS T. RIES

Now Hear This

In the article, *We Don't Have to Go Deaf on the Job* (page 123, November PM), the statement that only Missouri, New York and Wisconsin recognize hearing loss as a compensable occupational disease is extremely misleading. Hearing loss is compensable in California, and awards have been issued for at least ten years to my personal knowledge.

We do congratulate you, however, on this lucid article in a poorly understood area of occupational health.

WILLIAM W. STEFFAN
Senior Health Physicist

Dept. of Industrial Relations
Employment Relations Agency
State of California

Congratulations on your fine article. But why, oh why did the author say that we do not have a law in California covering this problem?
West Covina, Calif.

ROBERT M. HURDLE

Yes, there is a law in California. It took "about a year of detailed committee work" by major industries, unions and state officials to prepare it, Reader Steffan informed PM in a telephone interview. Unfortunately, PM's article was researched before the

California law was finally put into effect.

Along with each of the above letters came a copy of Article 55 (Standards for Noise Control) of California's Noise Control Safety Orders. And, indeed, the law is quite specific in stating that "the wearing of hearing protectors is mandatory" when the employee is exposed to noise of a given frequency and decibel rating for a given length of time.

An example: An employee must wear hearing protectors when exposed for five hours per day to noise with a frequency of 20 to 75 cycles per second at a decibel level of 110. The Safety Order goes on to cover variations in time of exposure, and frequency and decibel level of the sound.

Thank you, Californians, for correcting us. We heard you loud and clear.

Appropriate Controls

Your article *Controlling Your Car's Control Center* (page 158, December PM) is one of the best and most appropriate to appear in a long time. With winter there come some starting problems, and the article is a real help to understanding this part of the automobile.

Cincinnati, Ohio.

G. THOMPSON

Birthday Classic

I built a *Sidewalk Classic* (page 146, November 1963 PM) and presented it to our grandchildren on their birthdays.

They do five miles an hour, and the battery runs the car two hours per charging.



This car is not used on sidewalks, but on country roads. The owners are Chuck and Larry Buttke of Twin Brooks, S.D.
Nevis, Minn.

GORDON L. OLSON

(Please turn to page 10)

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Over the Editor's Desk

(Continued from page 8)

Cabin Cat

The construction of the cabin of my Pop-Cat (page 162, March 1961 PM) is a



variation on your alternate set of plans. I'd like to correspond with other Pop-Cat builders to exchange information. Carteret, N.J. **GEORGE F. SHERIDAN**

And we'll pass along any letters that Pop-Catters send you in care of PM.

Instant Skiing

As a skier of 20 years, I'd like to say that *You Can Ski Parallel in Seven Days* (page 100, December PM) puts more into six pages than ski publications and ski writers have been able to put into the writings of the last six years.

You have condensed the basic principles of the parallel technique into your admirable article, and with any concentration a conscientious skier should be able to come up with a recognizable Christie into the hill within the seven-day limit. Edmonton, Alberta **A. WEBER**

The article on skiing was most enjoyable, but we disagree with the author's statement that falls "jar the bones." There is nothing softer than snow—and nothing worse for a beginner than fear of falling.

The caption for the top photo on page 103 is definitely wrong. "The Coma Position" is what you assume after you've hit a tree! The author meant "comma position." New York, N.Y. **LUCIEN R. GREIF**

"Snow is soft," we said to *Outdoors Editor Stu James* (the author), and he said, "Ha!"

A skier of 15 years' experience, he admitted that in learning the new technique, he fell more often than he usually does—and came out with a number of black-and-blue spots as mementos of the course.

As for the "coma" position, the day that caption went through must have been punctuated by periods of coma on the part of several staff members.

The Editors

POPULAR MECHANICS

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Smog is not only hard on your breathing, but it also may be eating away your roof. Scientists at the National Bureau of Standards say that ozone, a particularly aggressive form of oxygen, is commonly found in smog. And ozone speeds up the chemical breakdown of asphalt, which accounts for 80 percent of roofing materials used in the U.S.

What kind of gear will our astronauts take with them on space jaunts of some duration? That's a problem that concerns scientists at General Dynamics who are engaged in designing the interior of a manned orbiting laboratory. One of their goals is to make the best possible use of available storage space.

According to these experts, here are some of the items that will be needed in space: special pressure suits and spares, bio-packs (life support packs to be worn while outside the spacecraft), disposable underwear, padded helmet, cleansing pads for bathing, vacuum shaving equipment, toothbrush (with toothpaste that can be swallowed) and nail clipper (used in plastic bag to contain clippings).

Human scent coming from a fingerprint on a glass plate remains detectable by a dog for over a month. That's if the plate remains indoors. If it's left outside, weather removes all trace of scent within two weeks, according to researchers at Duke University.

Whale hunters may soon be using an old South American Indian trick—a touch of curare on the missile. Russian whaling ships, which kill 5000 or more whales in a season, have found that the explosive harpoons sometimes work badly—dead whales sink and are lost before the ship can take them in tow. Curare just knocks the whale out. Anesthetized, he floats until the ship comes along to pick him up.

Beekeeper's aid. An English company has come up with a kind of stethoscope to

be used in listening in on beehives. Noise levels inside can indicate up to a month ahead when the bees will swarm. This is important to the keepers, who must be ready to put the swarms into new hives.

Keepers can open the hive every 10 days and judge (from the amount of activity around the queen) when swarming will occur. But this bothers the bees and interrupts honey-making.

The listening device selects noises in the 240-280 frequency range (middle C on your piano) that accompany the build-up of excitement foretelling a swarm.

A flying TV camera for spying behind enemy lines is getting a try-out in Canada. It has a small helicopter rotor to keep it aloft and is tethered to its base by a coaxial cable, along which it sends back its pictures.

A cool way to fight fires is being tried out by the Tokyo Fire Department. Firemen place a type of water gun close to the blaze, then move back out of the worst of the heat and out of range of falling debris, and direct the hose by remote control.

The world's flattest floor is in California. Engineers for a San Diego aerospace firm used a fine diamond-chip grinding wheel to put the finishing touches on a lab floor that is level to within 1000th of an inch in 10 feet.

The precision was made necessary by space-flight trainer equipment to be used in the laboratory. The various pieces of equipment will float on cushions of air, and the slightest unevenness would cause them to drift to the lowest part of the floor.

Greatest uplift of land ever recorded was caused by last year's Good Friday earthquake, reports the Coast and Geodetic Survey. The floor of the Gulf of Alaska rose more than 50 feet in places.

A glass-breaking machine has been developed by a British brewery to take care of unwanted old bottles. Feed the bottles in by hand, 600 an hour, and two busy hammers reduce them to bits less than half an inch in diameter that take up about one-tenth the space the bottles did.

Thanks to good weather when the comet Ikeya recently came "close" to the earth, astronomers got a good look at it through the 200-inch Hale telescope in California. Light from the comet was examined by spectroscope. One finding: Ikeya has about

(Please turn to page 14)

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Science Worldwide

(Continued from page 12)

the same proportion of carbon 13 as the earth. That led astronomers to conclude that this and other comets were formed within the solar system and are composed of matter left over from the formation of the planets. (An older theory held that comets wandered in from outer space.)

▼ ▼ ▼
New weapon for forestry men. It's a small, three-pound hatchet that's used to chemically thin out undesirable species of trees. The hatchet, according to an official of a tree growers' association, automatically meters and injects a specific amount of chemical when struck into the tree marked for removal. The tree dies within two to three weeks.

It's estimated that one man with the new hatchet can thin out around 2000 trees a day, which is four times better than the best of older methods.

▼ ▼ ▼
Bed can be bad for you—that is, if you lie in it for six weeks without once getting to your feet. Your muscles become flabby and your heart and circulation show marked debilitation.

It's thought that long periods of weightlessness will have a similar physical effect on astronauts. But now, researchers at a California aircraft company say they've found a way to keep the horizontal human body toned up: whirl it in a centrifuge for 30 minutes four times a day.

Sounds as if the cure is almost as bad as the disease.

▼ ▼ ▼
Sensitive detectors set up by the U.S. in Australia as part of a worldwide chain to check underground nuclear explosions behind the Iron Curtain have proved a help to Australian geologists. The devices have detected minor earth movements about which nothing had previously been known. Also, the center of Australia has been found to be so stable that it would be an ideal site for a special station to detect earth tremors.

▼ ▼ ▼
Pressures of 60,000 pounds per square inch, greater than those found in ocean depths, are created within a magnet recently built at the Massachusetts Institute of Technology. So much electrical current is driven through the copper coils that they would writhe and twist like snakes but for being confined by heavy steel. The magnet was designed for use in atomic research.

▼ ▼ ▼
Youngsters with acne wash their faces
(Please turn to page 16)

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Science Worldwide

(Continued from page 14)

too much, says the chief of dermatology at the University of Pennsylvania School of Medicine. It's bacteria, not dirt, that causes acne, the doctor points out, and all that washing may only serve to spread the bacteria.

↙ ↘ ↙
The Roughometer is a device developed by engineers at Pennsylvania State University to determine if roads need repairing. A wheel trails behind an instrument-laden truck traveling at about 20 m.p.h. The wheel's bounces are transmitted to instruments that can measure the road's roughness.

↙ ↘ ↙
Ten new X-ray sources in space were detected last year by specially equipped rockets, according to Dr. Herbert Friedman of the Naval Research Laboratory, Washington, D.C. At least two of the sources are thought to be neutron stars—the most "solid" objects discovered to date.

Neutron stars are thought to weigh many billions of tons per cubic inch. They are what's left over after a tremendous stellar explosion (supernova).

↙ ↘ ↙
If your boy or girl reads "saw" as "was" or tries to read from right to left, then be suspicious of a language disability called dyslexia. So warns a Maryland psychologist who explains that the condition occurs in many children of normal and above-average intelligence.

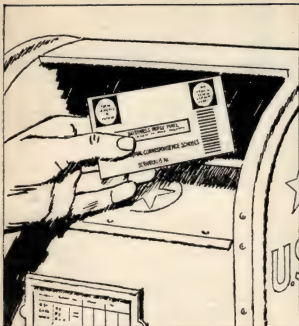
There is no agreement on what gives rise to the condition. Many researchers believe it to be hereditary. Dyslexic children can be helped, says the psychologist, if the problem is recognized early enough.

↙ ↘ ↙
Human hair may prove a good indicator of strontium 90 intake in the diet. That's the thinking of Public Health Service scientists as a result of analysis of hair samples taken from adults and children in Boston, New Orleans and Phoenix as part of a preliminary study.

When taken into the body, strontium acts similarly to calcium, part of it being deposited in bones, teeth, nails and hair. In getting samples of women's hair, investigators chose only the "natural" variety—bleaches and dyes, they decided, could have an effect on chemical content.

John F. Pearson
Science Editor

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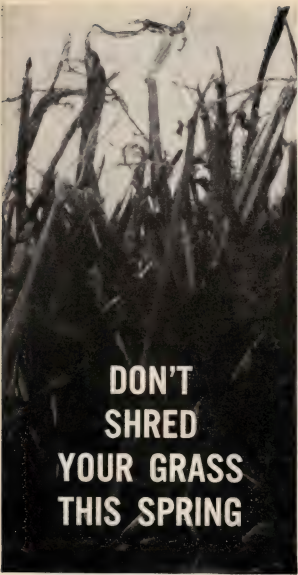
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Sidelights from the SERVICES

By William R. Kreh



An atomic gas gauge to tell how much fuel is left in an airplane's tanks is being tested by the Navy. The gauge, which uses atomic radiation, consists of a gamma-ray source and a detector mounted outside the tank. The amount of the low-strength gamma radiation passing through the fuel is measured by the detector. A compact electronics package converts this information to an electrical signal which is sent to a dial on the instrument panel.

The reading is not affected by sloshing of fuel caused by the maneuvering of the aircraft, as is the case with present gauges. The atomic gauge measures mass rather than level, and a recent test showed an average reading variation of only three percent, regardless of the plane's pitch, roll or acceleration.

A new electronic system which allows scientists to "fly" a complete antisubmarine warfare mission in a make-believe 250,000-square-mile ocean area has been installed at the Naval Air Development Center, Johnsville, Pa. The equipment includes a console and two display boards which allow the operator to monitor an entire ASW problem. One display board depicts an entire target area and the other gives an enlargement of a specific target. A submarine control station which can be tied in with the ASW system allows a second operator to make offensive and defensive maneuvers by one or more "submarines."

Future servicemen will have cat eyes when it comes to being able to see in the dark.

The Army is working on a variety of gadgets that intensify sky glow, starlight, or any other dim light, or use infrared rays. The Navy is going to test such equipment to improve night landings aboard aircraft carriers: the Marines will use it for combat much the same as the Army, and the Coast Guard is interested in it for improved night surveillance of coastal areas and harbors.

So far, the Army has come up with test models of an advanced sniper scope, infrared binoculars that mount on helmets, "black light" searchlights and other gadgets.

The new sniper scope, called the infra-
(Please turn to page 22)

POPULAR MECHANICS

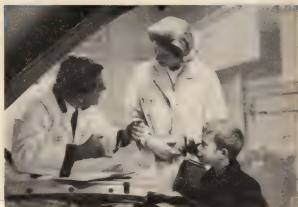
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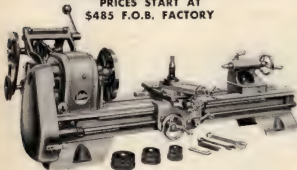
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Sidelights from the Services

(Continued from page 20)

red weapon sight, can be mounted on anything from a carbine to an M-60 machine-gun or 106-mm recoilless rifle. The old sniperscope, now in use, is limited to mounting on carbines. Helmet-mounted infrared binoculars now being developed will free a soldier's hands for driving at night, construction work, etc. Another new system, called the image-intensifier device, gathers natural light reflected from the target and intensifies it 80,000 times to present a visible image. Range is about 1000 yards. It will eventually be furnished to troops in the form of eyeglasses.



Giant robots may be nearer reality. A current Air Force project is aimed at determining if one such monster—weighing 11½ tons, with two 19-foot-long arms and “eyes”—can satisfactorily perform recovery and salvage work in radiation-contaminated areas that are unsafe for humans.

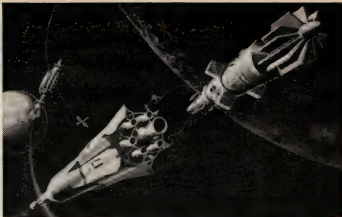
The robot is a vehicle that can be radio-controlled from a remote van. Four transistorized television cameras serve as the eyes. When fully extended to 19 feet, the arms, which are designed to simulate the movements of human arms, can lift 600 pounds each. The hands have a grip force of 3000 pounds—enough to crush a diamond—yet are dexterous enough to turn bolts and operate a cutting torch and a variety of power tools.

The operator moves the arms by manipulating control sticks which transmit radio signals to the vehicle. He can extend, retract, twist and turn the arms and operate the hands. He can also start, stop, turn and reverse the vehicle. Movements are so perfected, and depth perception is so good, that the operator—located in his van a mile away—can make the robot pick up a pencil.



Junk in the heavens is getting so common nowadays that the Air Force has organized a system to keep track of it and take note of its fall, or “burn in” as it is called. “Junk” means spent satellites and, often, parts of the rockets that drove them into orbit. Frequently the Air Force tracking service can predict where and when the burn-in will occur and alert one of the lookouts in its world-wide net to watch for it.

More than 260 artificial satellites have been launched. More than 100 are still up. From 30 to 60 more go up each year, most of them practically unnoticed. How soon we cease to marvel at the miraculous!



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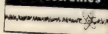
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NIMBLE HANDLING belies this heavyweight's curb poundage—about 3250. It hardly leans on corners, and independent suspension sticks to rough roads

Spotlight on the New

425-HP Corvette

A quick tromp on the loud pedal whisks you over any legal speed limit before you know it

By Alex Markovich

THE SPEEDOMETER NEEDLE was hovering at 140 when Zora Arkus-Duntov took his hands off the wheel. The Corvette stayed straight on course. "You see?" Duntov said. "Perfectly stable."

We were approaching a tight banked turn on the GM test track. Duntov rubbed off some speed with the brakes, then smoothly double-clutched into third and then second. Coming out of the corner, he punched the throttle. The exhaust blared

like a jackhammer as the speedo needle swept past the century mark again.

"This optional side exhaust is much louder than the standard type," Duntov said. "It's not too bad under steady throttle, but very loud when you accelerate. You might say it's for feather-footed extroverts."

This was my first introduction to the "1965½" Corvette with the new 396-inch,

(Please turn to page 26)

EVEN WITH SLIPPING clutch, wheel spin was most limiting factor in standing-start runs. Playful owners should prepare for frequent replacement of rear tires



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BILL ROCKETT, a Florida Associate —

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Mr. C. F. POTTS, a Texas Associate —

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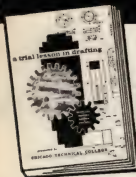
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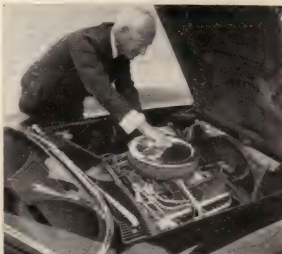
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Spotlight on the New Corvette

(Continued from page 24)



NEW ENGINE IS CHECKED OUT by Duntov. Components are accessible except for battery, hidden by body braces. The big radiator leans backward sharply

425-hp engine. Duntov, a charming, urbane man born in Belgium of Russian parents, can best be described as "Mr. Corvette." He has contributed more to the design of Corvettes over the past dozen years than any other engineer.

After a few fast laps, Duntov turned the car over to me. The Chevrolet people were understandably reluctant to let me do formal acceleration and mileage tests with a fifth wheel and flow meter. The car was a prototype, with a few problems still to be worked out before production (which should be starting by the time you read this). For example, just before I arrived, a new, more gradual clutch had been installed experimentally.

After Duntov's demonstration, the clutch was slipping badly and trailing smoke. Within a few minutes it recovered partially, but still wasn't right. In spite of this, I was able to crank out 0-60 (on the uncorrected speedometer) in 5.8 seconds, while 40-60 took 2.0 seconds and 50-70 just 2.2. I made all runs in first gear only—in which 7000 rpm, the tach red line, corresponds to an indicated 70 mph.

The big limiting factor in the 0-60 time was wheel spin. Also, the rear end was running streetable 3.36 gears. With big, slick tires and lower gearing, it should be possible to do 0-60 in four seconds. Just for fun, I tried 40-60 in fourth gear; surprisingly, it took only 4.6 seconds.

Squeezing 425 horses from 396 inches—without fuel injection or supercharging—takes sophisticated engine design. Bore and stroke are 4.094 and 3.76 inches.

(Please turn to page 28)

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Spotlight on the New Corvette

(Continued from page 26)



"IT'S A TONGUE-IN-CHEEK SCOOP," says Duntov. Louvers are real, but baffled to keep ignition dry. Hood sprouted phallic bulge to clear air cleaner

Though about the same weight as the now-defunct Chev 409 incher, the new engine most resembles the Chev 427 "mystery engine" that appeared in a handful of stock-car races some months ago and then vanished. The intake valves are angled toward the ports, which provides straight, unrestricted passages. And unlike the 409, the 396's wedge-shaped combustion chambers are in the heads, not in the block. A huge four-barrel carb provides the mixture.

The five-main-bearing bottom end is unusually beefy—which leads to speculation that the 396 may soon acquire additional cubes. Duntov admitted that the 425-hp. version could be bored to 427 inches; there's also a 325-hp. version of the 396, available along with the 425-hp. engine in full-size Chevrolets, but it has a different block that won't take as large an overbore.

Dropping over 100 extra pounds under the hood required changes in suspension. Roll stiffness was increased with a bigger front stabilizer and an additional rear stabilizer. This successfully eliminates a nose-heavy feel. Though the Corvette understeers slightly, those gobs of power make it easy to break loose the rear end by blipping the throttle. I tried yanking the wheel in either direction and letting go while doing about 70; the car straightened itself every time.

For durability, heavy-duty yokes, trunnions, driveshaft and wheel spindles are used. "People who want to drop the new engine in an earlier Corvette should be

(Please turn to page 30)

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Spotlight on the New Corvette

(Continued from page 28)

sure also to install these heavy-duty parts," Duntov warned. "The 396 bolts right into a 1965 Corvette, but earlier models have a different crossmember, which makes the conversion much harder."

The car is as civilized and comfortable as it is exciting. Ride is soft for a sports car, and the relatively long wheel-base eliminates pitching. The doors cut into the roof, making exit and entry easier. The steering column adjusts telescopically. Seats are comfortable, but offer hardly any lateral support—a curious omission in a car of this type.

Instrumentation is among the best I've seen. The tach and speedo are large and round, and there's a full set of secondary gauges. Legroom is adequate, but rear visibility is bad. Wonder why Chevrolet doesn't reshape that rear window?

The four-wheel disc brakes are powerful. My test car didn't have power assist, but very little pedal pressure was needed; in fact, it was all too easy to lock the wheels. The close-ratio four-speed gearbox is one of the best. Synchronization is crunchproof, and the gate short and precise.

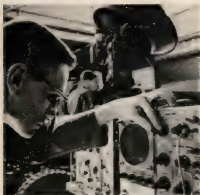
The old 327-inch, 375-hp Corvette was one of the fastest production cars in the world. The new one is even faster, and far more tractable. ★★★



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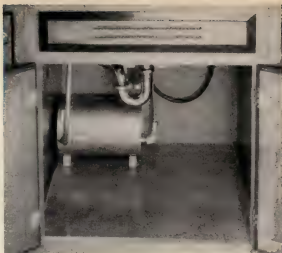
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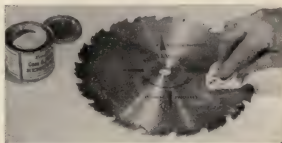
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Stop Gumming Up the Works: A newly marketed paste-like compound is said to remove gum and pitch from power saw blades, sanding discs, abrasive belts. To use it on saw blades, you apply the compound, rub in with a cloth, then wipe clean. On sanding discs and belts you work the compound in with a stiff brush. Retail price is \$1.25 for a 4-oz. can. From L. D. Newell, Box 455, Desert Center, Calif.



Masonry Cleaner, called Sonokleen, comes in powder form. Mix it with water and apply to any brick surface with a bristle brush and, according to the manufacturer, off come any accumulated dust, dirt or salt deposits. Retail for \$1 per 12-oz. box. From Sonneborn Building Prods., 1700 South Mt. Prospect Rd., Des Plaines, Ill.



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You won't believe your ears! The "500" gives you all the brute strength of 50 horses with just a murmur of engine sound. (West Bend's Acoustical Leg Chamber turns the volume down.) Yet you get robust power for water skiing, pleasure boating, or fishing with a boatload of companions. Amaze yourself — see your dealer (listed in the Yellow Pages) or write for color brochure showing all West Bends, 3½ to 80 h.p. — it's free.

Total Quality



TOP
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DEPT. 1443, ENGINE DIVISION
THE WEST BEND COMPANY
Hartford, Wisconsin

Sidelights on

AVIATION

The PM glider still stirs the imagination. The original story, with plans, appeared in the April, 1909, issue. In January we reported that a replica had been added to the collection of the Smithsonian Institution, creating a flood of mail.

More than a half century after it first appeared, men still want to build it and ask us to reprint the story. It's unlikely that we will, since the design—while great in its day, and wildly popular—is quite primitive, with none of the advantages of modern techniques.

However, we have been sending copies of the original article to those who write, with three bits of advice:

The design is crude and, since takeoffs and landings are made on the pilot's own legs, injuries are possible.

There were no regulations governing the building and flying of aircraft in 1909. There are today, and it's the responsibility of the builder to contact the Federal Aviation Agency when building aircraft. FAA inspectors will advise on proper construction methods and assign test-flight areas.

Finally, there is an excellent government booklet, *Basic Glider Criteria*, which tells you just about all you need to know for building gliders. It is available (for 75 cents) from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Automatic landings, which are being tested by several airlines (*Is Aviation Going Automatic?*, page 110, Feb. PM) may also be introduced into the business fleet. Lear Jet, which is producing a twin-jet executive plane, says it will install automatic-landing equipment on all production models once the system is approved by the FAA.

Unnoticed in the publicity surrounding our two newest jets, the B-70 and F-111, is the fact that none of the crew in either plane will wear a parachute. Each aircraft is equipped with "escape capsules," which can be blasted free of the fuselage.

Each capsule is airtight, with self-contained oxygen, and watertight so it will float if it lands in water. Huge parachutes float the capsules down to earth safely.

Kevin V. Brown
Aviation Editor

POPULAR MECHANICS



Introducing the latex wall paint with the built-in second coat

...new formula
Dutch Boy Nalplex.
 So high in hiding,
 so smooth in leveling,
 one coat looks like two.

Now, with new Dutch Boy Nalplex, you can roll on new beauty in a single coat. It covers so well, one coat looks like two.

New Nalplex is especially made for rollers. So there are practically no roller marks or spatter. No unpleasant paint odor, either.

And cleaning up rollers or brushes? Simple. Only a matter of soap and water.

Your Dutch Boy dealer is listed in the Yellow Pages. Ask to see his demonstration of new formula Nalplex: the paint with the built-in second coat.

DUTCH BOY AND NALPLEX ARE REGISTERED TRADEMARKS OF NATIONAL LEAD COMPANY

Dutch Boy Paints: more years to the gallon.



NEW!

Independent front suspension with big-truck durability!

You've never ridden in any pickup as comfortable—yet as rugged—as the '65 Ford. Secret is an exclusive new independent front suspension

that uses forged I-beam front axles borrowed from big-truck design. Result: untrucklike riding smoothness—lower maintenance costs.

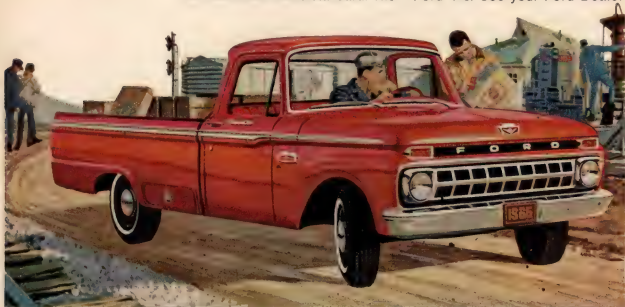


NEW!

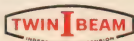
Two big new Sixes, powerful new V-8!

Choose from a completely new lineup of big, powerful engines when you pick out your '65 Ford pickup. A new seven-main-bearing 240 cubic inch Six is standard. The

impressive new 300 cubic inch Big Six is the biggest Ford Six ever built. Or prefer V-8 power? Check over the brawny new 352 cubic inch Ford V-8. See your Ford Dealer!



NEW FORD



PICKUPS

PRODUCTS OF  MOTOR COMPANY

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Send for this new wood finishing guide—
free from Weldwood, the people who know wood best.

The right **Weldwood** wood finish for each job

WELDWOOD		WOOD FINISHES										GENERAL INFORMATION				
FINISH	Color Tones™	WOOD FINISHES				WOOD PRESERVATIVE		WOOD STAIN				Color Chip	Type of Finish	Colors		
		Interior	Exterior	Marine	Decking	Water Repellent	Stain	Stain	Stain	Stain						
Color Tones™		•		•									138 to 140	Interior	Color chip	138
Deep Finish [®]			•		•								140 to 145	Interior	Color chip	140
P. A. R.*								•		•			145 to 150	Exterior	Color chip	145
Patiolife®									•	•			150 to 155	Exterior	Color chip	150
Satinlac®		•	•		•								155 to 160	Interior	Color chip	155
Firzite®		•							•				160 to 165	Interior	Color chip	160



Weldwood Deep Finish Firzite® gives furniture a rich "hand-rubbed" oil finish—without the hand rubbing. Protects, beautifies floors.



Weldwood Satinlac® for greater gloss than Firzite without a heavy "built-up" look. Contains ultraviolet absorber to inhibit yellowing.



Weldwood P.A.R.* penetrating exterior water repellent stain finish for sidings, fences. Guards against checking, can't blister. 5 colors.



Weldwood Patiolife® water repellent stain finish for outdoor furniture, decks. Its satin redwood color limits rub off.



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Weldwood Color Tones™, a precision stain system for matching trim and molding to wood paneling. Color chips of 138 shades simplify color-matching.

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MODEL W9316 SHOWN

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THE LUFKIN RULE COMPANY/Saginaw, Michigan

CLINIC FOR HOMEOWNERS

Q I have acquired an old pie safe. The wood is still in good condition but the perforated tin panels in the doors are badly rusted. Where can I buy new tin panels and how should I refinish the wood?—M.K., Pa.

A We wouldn't refinish the wood, if, as you say, it is still in good condition. Refinishing will reduce the value of the piece as an antique. What we would do is wash the wood with a mild soap solution, taking care not to get the surfaces and particularly the joints, unduly wetted. You may have to use fine steel wool very lightly to remove some of the more stubborn accumulations of the greasy grime which usually coats parts of such pieces. But be careful not to cut through the original finish. You can't buy tin panels readymade; in fact the originals usually were made by hand, using a nail to make the perforations to a pattern layout. Lay out the new patterns on new sheet metal using the old panels as patterns or any other pattern which is desirable and in keeping with the original. Then select a ten-penny nail with a good point, tape the sheet, cut to size, to a soft-pine board and make the perforations by tapping the nail lightly, until the point breaks through the metal. Be especially careful to keep the perforations uniform and to follow the pattern closely so that all perforations will be in line. When finished, coat the bright panels with lacquer to prevent rusting.

Q One wall of a rec room in my basement is paneled in pecky cypress. Recently, the basement flooded to a depth of about one foot, leaving a water mark on the boards. The wall was finished at the time of installation and the boards do not seem to be damaged by the water, but how can I remove the mark?—H.W., Ind.

A It is true, as you say, that cypress is not ordinarily damaged by water, that is, the wood itself is not warped or discolored to any appreciable extent. Success in removing the water mark may depend on the finish originally used. First, try removing several of the boards and

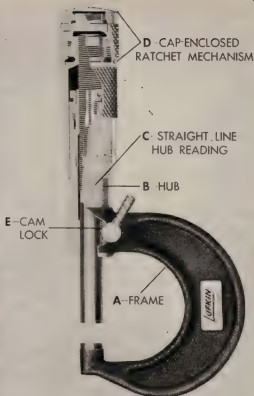
washing with a mild soap solution, working the water mark with a fine steel wool. Allow to dry and note the result. If it's satisfactory, then give all the boards the same treatment. If not, it may be necessary to remove the old finish. After removal of the finish (with a suitable chemical remover) a light sanding usually takes out the discoloration. Then refinish such boards, using, if possible, the same finish that was used originally.

Q How can I move an old style piano from a bare floor onto a rug? I tried it and it seems anything but simple. But there must be some way for a person to do it alone. Don't tell me to lift the piano. I can't.—D.E., Miss.

A No need to lift it. Lay two small pieces of plywood in line with the casters in the direction you wish to move the piano, one end of each piece of plywood on the rug, the other on the bare floor. Tilt the piano slightly with a suitable lever and slide the ends of the plywood pieces under the casters on one side, front or back as the case may be. Roll the instrument up the "ramps," tilt it again and remove the plywood pieces.

Q I installed new combination storm windows last year, replacing the old storms. Now I would like to salvage the glass in the old sashes and discard the frames. But the putty seems almost as hard as stone and I have broken several panes trying to remove them. Isn't there some simple way this can be done?—T.H., Minn.

A There are, of course, ways of removing the glass panes, but these can hardly be called simple. However, if you feel the glass is worth the trouble and time necessary to salvage it then perhaps the best procedure is to soften the putty with application of heat, either from a gasoline blowtorch or a propane torch. In this you will have to keep the fire hazard in mind and do the work at a safe distance from any flammable materials. One slow pass of the flame should soften the putty sufficiently to permit fairly easy removal with a putty knife, but one must watch the flame closely to avoid scorching the wood frames. It is likely you would find the propane torch best for the job as the flame is more easily controlled. Care must be taken not to heat the glass unduly as otherwise it is almost certain to crack. Once the putty has been removed, pull out all the glazier's points before attempting to lift the pane from the sash frame.



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THE LUFKIN RULE COMPANY Saginaw, Michigan

Shopping for Tools

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SELF-INSULATING TOOL, for safe handling of fuses, wires, electrical fences, spark-plug terminals, testing equipment and other hazardous objects, are made of nylon. According to the manufacturer, Safe-T-Tongs shield the user from up to 250 volts. Cost \$1.98 postpaid. From New Products Development Service, 10506 West Villard Avenue, Milwaukee 18, Wisc.

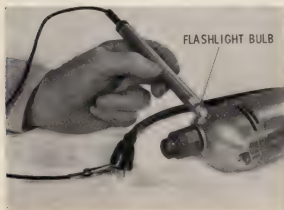


ELECTRICIAN'S SCREWDRIVER is equipped with a reamer for de-burring conduit. To operate, you place the screwdriver shank into the conduit so that edge of the conduit engages a notch in the de-burring blade. Turning conduit then shaves off the burr. Also serves as wire stripper and bending tool for loop eyes. \$2.25 Piggyback Level & Tool, Jutland, N.J.

CONVERT YOUR DRILL PRESS to a grinder with the Microm Grinding & Honing Attachment. This device, which sells for \$14.95, bolts to the drill press table. It's belt driven by means of a pulley which clamps in the chuck. Comes with belt, pulley, grinding wheel and all necessary bolts and washers. Microm Co., 2822-A South Halladay Street, Santa Ana, Calif.



DUAL PURPOSE POCKET TOOL can be used as a flashlight or a continuity tester. Has a removable cord that connects to one end of the circuit being tested. Touching the flashlight tip to other end of the circuit causes the flashlight bulb to glow if the circuit is continuous. Sells for \$2.98. From Marfree, Inc., 17620 James Couzens Highway, Detroit, Mich.



Shown below—the neatest squelch of all, the Chevelle Malibu SS Coupe



The perfect squelch: 350-hp CHEVELLE by Chevrolet

That's a potent squelch to all those others who keep talking about lions, tigers and such.

A 350-hp squelch goes into any '65 Chevelle you specify. It's that big blue-jowled 327-cubic-inch V8 of song and story, fortified with an 11.0:1 compression ratio, big 4-bbl. carb, dual exhausts and 360 ft.-lbs. of torque at 3600 rpm. With *hydraulic lifters*.

Then, too, you can order a 4-speed fully synchronized transmission. A beefier special

front and rear suspension package. Sintered-metallic brakes. Positraction with 3.31:1 axle ratio. And an electric tach.

All this performance would go great in a heavyweight. Just run your imagination over what it does for the welterweight Chevelle. Not to mention the silencing effect on all those tigers and tamers.

But why rub it in? That's your privilege. Many happy squelchings.



Chevrolet Division of General Motors, Detroit, Mich.



By Ed Nelson



Dodge's Charger II Will Not Appear This Year, But Look for the Bigger Beetle This Summer

"TRICKY" IS THE WORD for the new telescoping steering column **Saginaw Steering Gear** is producing for **Corvair**, **Corvette**, and **Cadillac**. Loosen the wheel hub and you get up to three inches of extra stomach-relaxing space. And spinning the wheel fast—to work your way out of a skid, for example—is lots easier with such extra maneuvering room. You can avoid getting tangled up in an excess of elbows.

Nobody *plans* to get into a skid situation, however, so there may be few buyers at GM's prices: \$43.05 to \$91.40. **Standard-Triumph** has had, for years, a standard-equipment system you set for the life of the car. It collapses away from you in case of a crash. (**Corvair** owners can add to their elbow room with a less fancy wheel. It's dished less, leaving the rim a little farther away.)

Disregard the rumors—in print or otherwise—about **Dodge** producing its fastback **Charger II**. It isn't going to happen. Wary observers weren't taken in by this one, even at the start. The **Charger II** styling is far too extreme; it's bound to excite some car nuts, but offend others. Any extreme step gets a similar reaction, and Detroit isn't about to risk making enemies. (Even so mild a step as the lump in the sheet metal above the '65 Chevy's rear wheels irritates some owners.) **Dodge's** dream car is that and nothing more. Such a blue-sky design does, of course, get extra attention for **Dodge**. That's one of its main purposes. And some features of it might reach production.

DR. MERRILL ALLEN, the Indiana U. optometrist with all the ideas about car visibility, has another: More than 80 percent of the drivers have eye defects causing red lights to seem farther away than they are, he says. So normal taillights should be green, according to Dr. Allen (indicating it's safe to follow them). He'd keep stop lights and turn signals red.

Chevrolet's long-rumored three-speed automatic and high-powered engine are here; for our report, see *PM* Feb. P. 94.

Ford owners with leaky power steering systems might peek under the hood to see

that hose lines aren't being burned—or cooked beyond endurance—by the exhaust manifold. In the second month of production, **Ford** service engineering inspectors found some '65s had had power steering hoses mis-routed over the manifold. Engineering subsequently designed a clamp that makes the assembly error impossible, but some early ones got by.

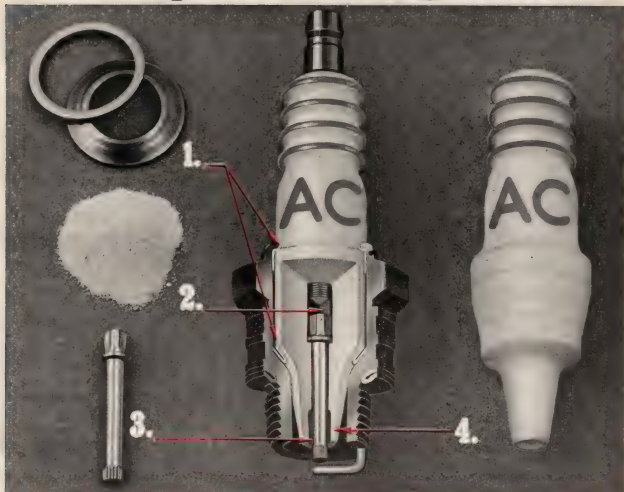
IF YOU'RE TEMPTED by the **VW 1500**, hold off a little longer. A few of the cars are in the States, brought by returning tourists or GIs who got them in Europe. Most, however, come in through bootleg dealers without the equipment for proper service, nor the staff, nor the interest. But so many of the bigger Beetles are coming in that, starting in August or September, **Volkswagen of America** will import them. New parts, stocks and mechanics' training programs were necessary to get ready for the 1500, but by summer's end you should be able to buy one with good backup service.

In our January comparison of the **Plymouth Barracuda**, hot **Mustang**, and **Corvair Corsa**, the **Barracuda** bucked a heavy disadvantage. Our rush request for the hottest car caught **Plymouth** by surprise. They produced one quickly and it had the power, but not the equipment to handle it. Now I've had a couple of days in a properly equipped **Barracuda Formula S**—long enough to be impressed. Control was fine; ride was firm without being uncomfortable; steering was quick and exact without being nervous.

Al Markovich, *PM's* associate auto editor, as part of his continuing research with New York cabbies (see p. 124), found a student of humanity. This driver saves empty payroll envelopes and fills them with dollar-bill-size scraps of newspaper. He leaves these in the back of the cab and waits for his fares' reaction. He told Al he once had a run of seven in a row, who, thinking the envelopes were full of cash, returned them.

And for the not-so-honest, there's an appropriately symbolic reward. Included in each packet are two cents.

Only **AC** Spark Plugs have all these built-in power-boosting features



1. Extruded Internal Gasket provides gas-tight sealing between insulator and shell, assures peak engine compression under severe operating conditions. **2. Fused Metal-Glass Seal** assures maximum electrical conductivity, and at the same time prevents combustion gas leakage around the center electrode. Guards against spark plug overheating, pre-ignition and possible engine damage. **3. Knurled Center Electrode** provides greater sparking capability to ignite combustion gases more easily, delivers maximum power, maximum fuel economy. **4. Self-Cleaning Hot Tip Insulator** heats faster to help prevent fouling, cools faster to help prevent pre-ignition. Helps assure top economy with maximum engine performance at all speeds. These four important AC design-features combine to help produce continuing maximum energy out of the fuel you buy; boost power, performance, mileage. Put all these spark plug features to work for you. Tune up for power with AC Fire-Ring Spark Plugs—best for all cars.

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Noteworthy New INVENTIONS

By M. J. Pedersen

Pillproof wall plug, which fits ordinary sockets, has a screw with a non-backout head to prevent its being pulled out. Earning patent 3,161,450 for Bradford A. Goodenough, Athens, Ga., the plug can be used in hotels to prevent visitors from absconding with appliances or to deter plug-pulling youngsters who might accidentally cut off refrigerator current.

Seasoning injection enables chickens to be flavored—as well as fattened—before they are killed for eating. A solution of the seasoning ingredient (sage, garlic, nutmeg, sesame, etc.) and the enzyme hyaluronidase is injected under the neck skin of the fowl. The hyaluronidase spreads the flavoring quickly and uniformly throughout the flesh of the bird, which is killed and processed a short time later. Dr. John F. Murphy, Chicago Heights, Ill., and Robert E. Murphy, Union, Mo., received patent 3,159,489 for the flavoring technique.

Elements 95 (americium) and 96 (curium) recently were awarded patents 3,156,523 and 3,161,462 respectively for Nobelists Dr. Glenn T. Seaborg, chairman of the U.S. Atomic Energy Commission. Patent applications were made in 1946, two years after the synthetic elements were isolated. Identification of element 95 actually followed identification of element 96, which was produced by bombardment of plutonium 239 with helium ions in a cyclotron. Americium was made by bombarding plutonium 239 with neutrons in a nuclear reactor. Only recently has a practical use been found for curium, which is an intense neutron and heat source.

Handgun stabilizer, currently used by the Fairfax County, Va., police, helps policemen acquire skill in shooting a pistol accurately by preventing the shooter's wrist from wobbling as he pulls the trigger. Accuracy is lost mainly by an unwanted wrist movement. Consisting of a steel rod, which is attached to the gun handle on both sides and cradles the lower part of the arm and wrist, the training aid earned patent 3,162,966 for Gregory M. La Coss, Falls Church, Va.

Hunting for an outboard that packs almost twice the punch of a 3 hp engine, weighs only 9 lbs. more, and is priced so right it almost seems wrong?

Presto!

The carefree, new 5 (a Sea-Horse, of course!)



The Sea-Horse 5 represents a new idea for Johnson: an economy engine that's as simple and light and low-priced as can be made and still be all Sea-Horse. This new 5 is ideal for small, rental resort boats and for use as an auxiliary. And because its new low-compression cylinder head all but eliminates vibration, it's a truly magnificent troller.

Weights only 43 pounds . . . so you know it's a cinch to carry—and a clean starboard side lets it stow flat as a guide's biscuits. Full-pivot 360° steering lets you reverse without a gear-shift.

No need to buy special marine fuels. From 3 to 90 hp, all

17 new Johnson models (including the nickel-nursing 5) use regular grade gas and oil. What's more, a new 50 to 1 gas-oil mix halves oil costs!

Only Johnson has sold over 2½ million outboards. You can be sure we know how to keep the Corrosion and Noise out. You'll like our 2-year warranty*. For the right engine to fit your needs see your Johnson dealer. He's in the Yellow Pages. Johnson Motors, 1940 Pershing Rd., Waukegan, Illinois. Div. Outboard Marine Corp. In Canada: Johnson Motors, Peterborough, Ontario.

*For 24 months after purchase, Johnson Motors will replace, without cost to the original purchaser, any part of its manufacture which upon inspection proves to have failed in normal use due to faulty material or workmanship.

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Items from All Outdoors

UCLA zoologist Dr. Vladimir Walters has proven that the wahoo, a species of mackerel, really lives up to its name. During a six-month experiment to determine the swimming speeds of various fish, Dr. Walters timed the wahoo at 48 miles per hour. It was previously believed that the top speed of any fish was 27 mph. The yellowfin tuna finished close behind the wahoo with a recorded speed of 45 mph.

Taking apart an expensive split bamboo fly rod is a delicate operation that can often be a costly disaster when the ferrules (the sleeves and metal caps that bind the sections) are bent because of pres-



sure. This is easily eliminated by holding the rod behind the legs, gripping the sections tightly close to the ferrule, the forearms snug against the nape of the knee. In this position you simply squat, a movement that spreads the knees with equal pressure. The arms are forced out and the ferrule is pulled apart smoothly with no angular pressure to damage it. This tip was demonstrated by Lawton Carver, a maestro of fly casting, and in next month's *PM* he outlines a unique teaching method that can turn a novice into a skilled fly caster in just 60 minutes.

With African wild animal herds being obliterated, a friend suggests we remember Will Cuppy's famous admonition: "No Gnus is Good News."

STUART JAMES

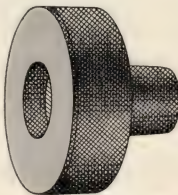
Outdoors Editor

POPULAR MECHANICS

What does it take to come up with a Ford that rides quieter than a Rolls-Royce?

(In tests certified by the U.S. Auto Club, results showed that a 1965 Ford Galaxie 500 LTD, with the 289-cu. in. V-8 engine and Cruise-O-Matic transmission, rode quieter than a new Rolls-Royce!)

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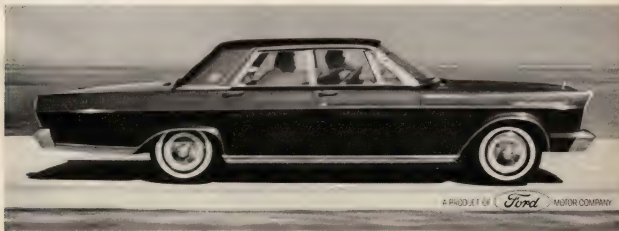
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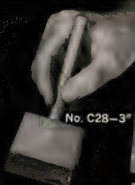
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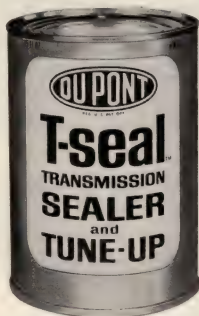
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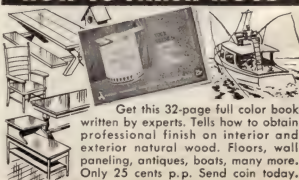
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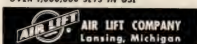


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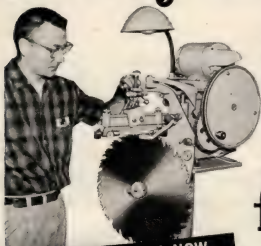
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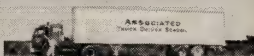
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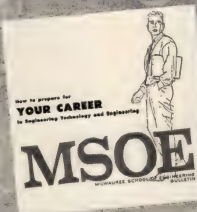
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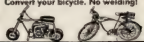
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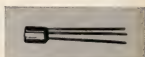


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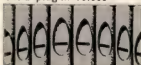
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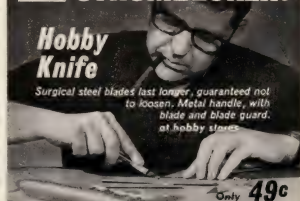
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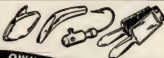
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RAISE Rabbits and fishworms on \$500 month plan. Free details. White's Rabbitry, Mt. Vernon, Ohio.

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EARN Big commissions full or part time. Show America's largest, line low priced business printing and advertising specialties. Calendars in season. Big free sales kit samples hundred items used daily by business people. Build profitable repeat business. Start right now. National Press, Dept. 19, North Chicago, Illinois.

LEARN The secrets of repairing junk batteries, "Fabulous Profits" at home. Details. Batterymen, Prunedale P.O., Salinas, California.

UNUSUAL Money-making opportunities. Free literature. Eaton's, 708PM Gold, Centalla, Wash. 98531.

MAKE Figurines, plaques, lawn ornaments. Molds, plastercraft kits, liquid rubber. Sample and catalogue 10¢. Woolley Company, Box 29-B, Peoria, Illinois.

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MINK Raising information free. Lake Superior Mink Farm Inc., Superior, Ell, Wisconsin.

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"HOW To run mail order business profitably." Write Jester, 524 W. Godfrey Ave., Philadelphia, Pa. 19126.

BIG Profits mailing baby catalogs imprinted with your address to New Mothers. Details, Catalog 25¢ (refundable). Waterworth Company, Box 1960, Lancaster, Calif. 93535.

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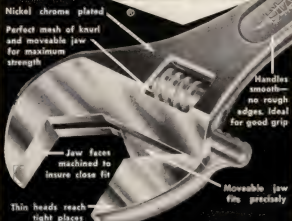
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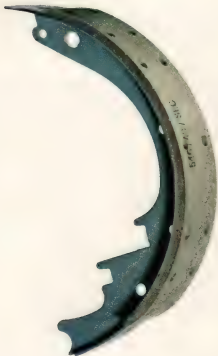
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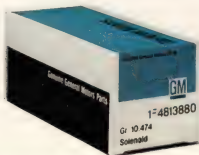


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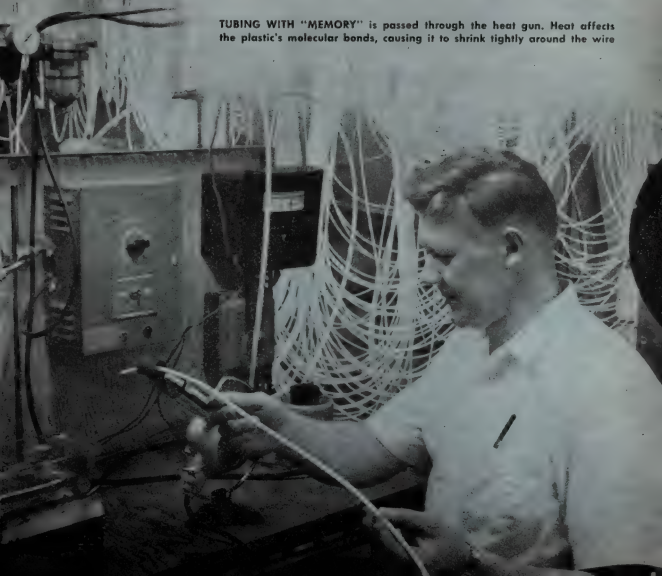
WONDERFUL
WORLD OFIRRADIATED
MIRACLES

Wood with finish all the way through, plastic that shapes itself, food that stays fresh—they top a growing list of startling atomic products

By John F. Pearson

THERE'S A NEW KIND OF WOOD that you won't find in any home workshop—not yet, anyway. It's up to nine times harder than normal wood of the same variety. A column made of it will support as much as 50 percent more weight than its country cousins. It takes between 50 and 100 percent more stress to bend it. It's fire-resistant. And, what's more, if you scorch it with a cigarette, a light sanding will remove the mark—but not the

TUBING WITH "MEMORY" is passed through the heat gun. Heat affects the plastic's molecular bonds, causing it to shrink tightly around the wire



clear, satiny finish which is indestructible. The sanded area—no matter how deep—will have the same sheen as the rest of the piece, because the “finish” goes clear through to the center.

This is no “miracle” of the future. It's in existence now, though not on the market. It is a plastic-wood composite.

The unique new material is only one of a number of new products, and improved old ones, now being produced by means of atomic radiation. Nuclear particles have proved an efficient way to preserve food and sterilize medical supplies. They are putting toughness into plastics, making them heat resistant and giving them “shrink memory.” They are producing a new kind of detergent that's sudsy in the dishpan, but is quickly broken down by bacteria when it hits the drain. Radiation also improves transistor performance.

Beauty of the process is that it leaves no residual radiation in the product.

“We're working with a whole new technology,” says Martin H. Stein, chief of the Atomic Energy Commission's process radiation section. “And we're just beginning

to reap the rewards of a research and development program started less than 10 years ago.” E. Alfred Burrill, vice president of the High Voltage Engineering Corporation, a producer of radiation devices, thinks that the field is “at about the point Thomas Edison was when he started playing with the distribution of electricity.”

The process for making the plastic-impregnated wood was developed a few years ago by Dr. James A. Kent at West Virginia University. The idea of combining the two substances occurred to him one night in 1960 after he'd gone to bed. He jotted down a few notes and shortly thereafter put a graduate student to work on the project. (Dr. Kent loudly disclaims any role as the discoverer, however. The development, he points out, was a natural outgrowth of exploration that went on in many places—Brookhaven National Laboratory, New York, and a research center in Russia, among others.)

Here's how it works:

Wood is placed in a vacuum chamber. Then plastic, thinned to the consistency of water, is pumped in. The wood absorbs



POLYETHYLENE BOTTLES shown have just been taken from boiling water. Those that had been irradiated retained their shape, but untreated ones collapsed



IRRADIATED TUBING is at cold size on lower pair of pliers. Moderate heat makes the plastic contract and form a tight, insulated grip for handle

the plastic the same way a sponge soaks up water; when you squeeze a sponge, you expel air from its cells and it is then able to take up a liquid. Similarly, air is "squeezed" out of the wood cells by the vacuum, and is replaced with the plastic as it enters the chamber and replaces the vacuum.

Then the wood is irradiated with a gamma ray source such as cobalt 60. This bolt of energy causes a vigorous chemical reaction to take place in the liquid plastic, transforming it into a tough solid. Dr. Kent and associates have used the process on many different kinds of wood, but have worked primarily with white pine, sugar maple, birch and white oak.

The irradiated composites have amazing qualities. Depending on the kind of wood used, they are up to 900 percent harder than untreated stock. They may have a 50 percent greater compression strength and from 50 to 100 percent greater bending strength. They absorb moisture much more slowly than untreated wood, allowing them to resist warping and swelling, and are fire resistant.

And that's only half the story. In most cases this "wonder wood" actually looks better than the natural stuff. The process enhances grain and color. Stains can be built in simply by adding a dye to the plastic. Scrape a board treated this way and you'll never hit raw wood.

Martin Stein and engineers at the Lockheed-Georgia Company, which is exploring the potential of commercial production, say the composites will be ideal in places where wood ordinarily rots, where resistance to wear is important, where a natural finish is called for.

Indoor and outdoor furniture made of composites will be virtually indestructible.



ORDINARY WOOD is put into vacuum tank. With air sucked out, cells soak up liquid plastic sprayed into chamber. Gamma rays solidify the plastic



PLASTIC-WOOD composite, though many times harder than untreated wood, can be worked in the usual ways. It can be sawed, drilled, turned and sanded

THESE COMPOSITES were made from pine, maple, birch and oak. The process retains and enhances natural look of wood and creates a built-in hardness. Gavels can drive stakes into hard ground without showing a scratch

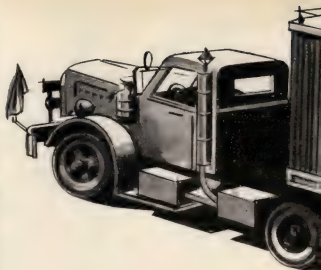




LEMONS are loaded into research irradiator at the University of California. So far, irradiation has not been as successful with lemons as with oranges



DETERGENT SUDS in beaker at right are standard. They failed to break down under induced bacterial action. Irradiated product (left) decomposed readily



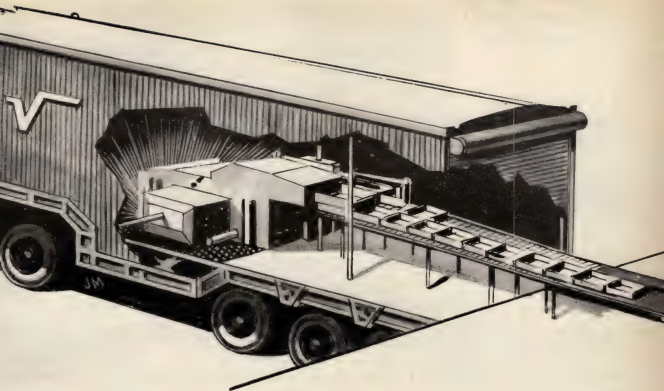
MOBILE IRRADIATOR for use next summer is under construction for Atomic Energy Commission. It will be used on fruit right after picking to get most benefit from pasteurization. It can follow harvest crews as they move through a region

Fine flooring, boat decks and bowling pins and lanes will just about last forever. Doors and window frames will have a built-in resistance to moisture. Gun stocks will have the strength and hardness of plastic but the full beauty of natural wood. There's the possibility of a whole new family of natural wood shingles.

The nice thing about this new "super-wood" is that it can be worked just like any wood. It can be sawed, drilled, turned and sanded. But in handling it, its special characteristics must be kept in mind. Like many other miracle products, it does have its Achilles' heel.

One golf club manufacturer learned this after he'd had a number of heads for drivers made from a composite. They looked fine and promised to wear like iron. But one screw after another was ruined in attaching the small metal plate to the underside of the club heads.

The manufacturer finally came to the AEC for help. There it was explained to him that the composite doesn't "give" the way wood does because of its lack of air cells. Since he'd drilled the same size holes as he had for normal wood, the screws got stuck in the hard material and broke off. The solution, he was told, was to drill



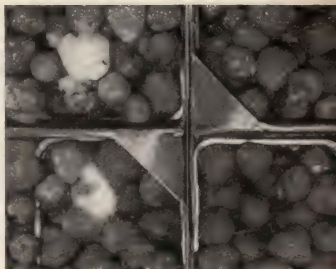
the holes to a slightly larger diameter.

All industrial radiation operations employ either a cobalt-60 isotope or particle accelerators—atom smashers like the cyclotron—as the energy source. The cobalt emits gamma rays—electromagnetic waves similar to X rays. The accelerator delivers high-energy electrons, like the electrical energy charge in a bolt of lightning.

Each has advantages and drawbacks. Electrons have limited penetrating power but are easily focused on the target. Gamma rays, on the other hand, penetrate much more deeply but are a relatively low-power source of energy. To deliver a large dose takes much longer with cobalt 60 than with an accelerator. But both forms of radiation affect materials in basically the same way.

They knock pieces loose from molecules, making them highly unstable. The “damaged” molecules vigorously seek to regain stability and so hook up with a molecule of the same family. Multiply this thousands of times and you have a first-rate chemical reaction. The result is a change in molecular structure.

A plastic such as polyethylene is made up of carbon-hydrogen molecules, or links, strung out in long chains. For purposes



STRAWBERRIES (left) stored for eight days at 41 degrees F. became moldy. Irradiated fruit (right), stored under same conditions, was free from decay

of illustration, you might think of a piece of polyethylene as being made up of many, many such chains, all parallel to each other and running in the same direction. But when the plastic is irradiated, some links are broken. They immediately swing out and connect with a broken link in the nearest chain to form a short bond across

(Please turn to page 228)

PM OWNERS REPORT

A Nationwide Survey
Based on 725,874
Owner-Driven Miles



PARKING AND MANEUVERING ARE EASY, thanks to fast power steering; handling was favorite feature of nearly half of owners. Dealer can adjust the driver's seat for height—which may be why 9.9 percent praised visibility

Easy Dodge Handling Tops Beefs About Assembly

*Marginal and boldface comments by Ed Nelson,
PM's Automotive Editor*

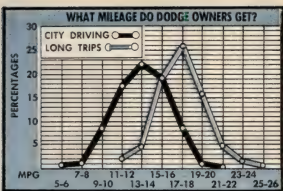
THIS CAR probably came off the truck assembly line," complains a marketing man from New Jersey. But he gets an immediate argument from other owners. One in particular, a Massachusetts teacher, likes the way Dodges are improving. "Ever-excellent engineering continues in '65," he told us, "and now Dodge has good looks."

Owners surveyed by PM also reported their pleasure with features ranging from good handling to details like a good heater. And they registered complaints ranging from bad assembly and workmanship to details like the shallow glove box. The dispute between the marketing man and the teacher continued to another general area: Good ride was the second most popular virtue owners reported, and the teacher agrees

Dodge owners
complained less about
assembly than owners
of some other
1965s tested →



EXTRA-NARROW REAR PILLARS and the king-size rear window contribute to excellent rear visibility. Rear passengers enjoy more than adequate headroom



Owners Like

- Easy handling (47.1%)
- Solid ride (26.5%)
- Clean styling (25.1%)

But Dislike

- Careless workmanship (12.1%)
- New shift lever (8.5%)
- Rattles and squeaks (6.3%)

TRUNK DISPLACES 16.7 cu. ft. of usable space, a bit below the average for full-size cars. No owners praised the trunk, but only 1.8 percent complained



"TRANSMISSION pushbuttons, please," clamored the 8.5 percent of Coronet owners who were asked what changes they'd like most. Buttons were replaced by console or steering-column levers on all Chrysler Corp. cars in the hope that more conventional shift would attract more new customers



The smaller Coronet's 230-hp option is easily its most popular engine. But most big Dodge buyers stuck with its basic 270 mill →

Both speedometers were almost dead—on at 30, 6½ mph fast at 70. Odometers were about 3% high →

it's comfortable. But the marketing man calls it "very hard," and comments, "I traded in a '62 Plymouth that rode better than the Dodge."

The cars—we surveyed owners of both the new 117-inch-wheelbase Coronet series and the 121-inch-wheelbase Polara, Custom 880 and Monaco—are generally successes with owners. More than 87 percent told us they'd buy another Dodge based on their experience with the '65. That's better than the average results for all '64s and compares well with the other '65s checked so far. And over 60 percent called the Dodge Excellent, while a miniscule 0.5 percent called it Poor.

Coronet owners generally got in-town fuel figures of 13 to 16 miles per gallon, long-trip results of 17 to 18, and overall consumption at 15 to 16. Big Dodge owners reported 11 to 12 in town, 15 to 16 on trips, and from 13 to 16 overall.

For PM's steady-speed fuel tests, which provide a cross check on owners' reports, we used two Coronets, a 265-hp, two-door 500 and a bigger, heavier Coronet convertible equipped with the 315-hp, 383-inch V8. Both had SureGrip differentials and oversize 8.25 x 14 tires.

The fifth-wheel speedometer and electric fuel meter were hooked up to eliminate any problems of inaccurate car meters. Here are the fuel consumption rates in miles per gallon:

	30 mph	40 mph	50 mph	60 mph	70 mph
265 hp	19.33	18.20	17.41	16.28	14.02
315 hp	18.43	17.75	16.68	14.16	12.80

With the 265-hp Coronet and Torque-Flite transmission, we obtained an overall fuel figure of only 10.803 mpg. The test involved little highway driving, however, and included the acceleration tests. Normal driving should deliver better economy.

The same two Coronets were used in our acceleration runs. The small improvement that results from the big power of the four-barrel 383 may surprise you, but when times start to get low, a small further improvement demands lots of extra horse-

power. Besides, that 383 was pulling a convertible, about 300 pounds heavier than the hardtop. Here are the times:

	265-hp 361	315-hp 383
0 to 60	9.2 sec holding car in L until 45 mph 10.2 secs starting in D	7.7 secs holding car in L until 46 mph 8.5 secs starting in D
40 to 60	5.1 secs using 2nd	3.8 secs using 2nd 3.5 secs shifting from L to 2nd at 46 mph
50 to 70	6.1 secs using 2nd	4.7 secs using 2nd

What do the owners themselves have to say about this year's Dodges after living with the cars day after day, in town or on the highway? Here are samples of the most common remarks, with those mentioned most often being listed first. Dodge's easy handling leads off:

"I have the feeling of complete control at high speed or with any road condition."—Pennsylvania laborer.

"It's easy to handle in traffic."—Arkansas storekeeper.

"The ride is above average—like a dream."—Kansas mechanic.

"It's heavy and sticks to the road well."—retired North Dakotan.

"It looks like an automobile, not a bloated cow."—South Carolina traveling salesman.

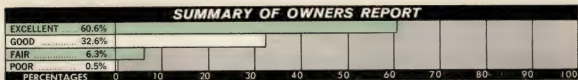
"Simple lines give it the appearance of a luxury car."—Pennsylvania fireman.

"The engine response and pickup is very good."—Kansas postal clerk.

"The bench seats and the suspension system make this

← *Famous last words department. Rather solid suspension actually helps control*

He's talking about his Coronet with the 230-hp V8 engine



Best-liked features			Least-liked features			Other car considered, if any		
Ease of handling	47.1%		Assembly and workmanship	12.1%		None considered	31.4%	
Ride	26.5		Shift lever replacing buttons	8.5		Chevrolet	26.9	
Styling	25.1		Rattles and squeaks	6.3		Ford	20.6	
Overall design	24.7		Carburetor trouble	6.3		Pontiac	11.7	
Power and performance	21.5		Gas mileage	4.9		Plymouth	11.7	
Plain lines	21.5		Ash tray	4.9		Is Dodge family's only car?		
Seats	19.7		Bumpers	4.5		Yes	58.3	
Comfort	13.9		Wind noise	4.0		No	41.7	
Upholstery	10.8		Chrome	4.0		Make of other car		
Visibility	9.9		Transmission trouble	3.6		Another Dodge	13.5	
Dashboard	9.4		Grille	3.6		Ford	5.8	
Roominess	9.0		Dashboard	3.6		Chevrolet	4.0	
Size	8.1		Idiot lights	3.6		Plymouth	3.6	
Brakes	7.2		Styling	3.6		Make of car traded in		
Warranty	6.3		Steering	3.1		Dodge	35.1	
Instrument panel	6.3		Spare tire location	3.1		Chevrolet	9.0	
Interior	5.8		Ride	3.1		Plymouth	8.5	
Economy of operation	5.4		Heater	3.1		Ford	7.4	
Transmission	5.4		Tailights	3.1		Dodge Dart	4.9	
Grille	5.4		Windows	3.1		No trade-in	9.9	
Gas mileage	4.9		Doors	3.1		Dealer Service		
Front-end design	4.9		Glove compartment	3.1		Excellent	58.3	
Assembly and workmanship	4.5		Power-steering trouble	2.7		Average	31.8	
Point	4.5		Electrical-system trouble	2.7		Poor	4.5	
Dodge decision based on			Headroom	2.7		Would you buy from him again?		
Styling	29.6		Instrument panel	2.7		Yes	74.9	
Previous Dodge ownership	27.8		Lack of roominess	2.7		No	6.3	
Warranty	18.8		Fuel economy			Buy another Dodge?		
Price	16.1		About as expected	51.1		Yes	87.4	
Dealer	10.8		Better than expected	21.1		No	7.2	
Chrysler Corp. reputation	10.3		Not as good	20.6		Undecided	5.4	



WINDOW VENTS have no cranks and are clumsy to open except by reaching across with the right hand. Worse yet, they won't stay open at high speed; wind resistance pushes them closed

Domestic car builders → change products more often, have more trouble staying sharp

Too many owners, 6.3 percent, have carb → trouble for us to say they might be cranks

about the most comfortable riding car I have ever driven."
—Washington receiving inspector.

"The seats are high, which provides comfort."—Alabama management analyst.

Dodge said it dropped its pushbutton transmission in hopes of winning new customers. The old ones, as the company reported, were happy with the buttons. Their absence prompted complaints second only to assembly and workmanship. Here are sample comments:

"This car does not match the detail quality of construction of my trade-in (Sunbeam Alpine), although it costs approximately the same."—Louisiana mechanical engineer.

"The handwork in assembly does not keep pace with its good engineering."—Kentucky commercial artist.

"I was fond of those pushbuttons."—Maryland railroad brakeman.

"Too many rattles in the dashboard."—Virginia appraisal executive.

"This is a noisy car with many little squeaks and rattles."
—Maryland electrical engineer.

"I've had carburetor leakage that caused a mileage drop. The car idles roughly, stalls occasionally. It's hard to start every so often and the carburetor bottom is usually wet. I've had enough practice fixing old cars to know I'm right."—Massachusetts computer programmer.

"I've had trouble with a sticking needle valve."—Pennsylvania insurance agent.

"My Monaco has a 383-inch engine, and 12½ mpg overall isn't economy in my book."—Tennessee textile worker.

"My main complaint is gas mileage, 10½ to 12 mpg with a 270-hp Polara."—Louisiana auto mechanic.

A good view fore and aft and the virtues of the Dodge inte-

(Please turn to page 234)



A Nationwide Survey

Based on 670,472

Owner-Driven Miles

Olds Owners Like Feather-Light Handling, Lament Wind Noise

*Marginal and boldface comments by Ed Nelson,
PM's Automotive Editor*

THE NORTH DAKOTA FARMER who exulted—"I have never owned a car that could outperform this one on the highway, yet handle as well in snow or mud or on ice"—has lots of company among other '65 Olds owners.

But so does the painting contractor from New Jersey who complained of wind whistling past his windows. Wind noise topped the list of complaints in Olds owners' reports, while handling ease topped the raves. Next best rave notice went to the floating ride; third loudest applause to power and performance.

Reports of ill-fitting doors and curved glass windows often tied in with wind noise references. The rake of the open edge doors and windows is "hazardous" according to some owners.

A rural mailman spoke for 35 percent of his fellow owners,

"SLEEK" AND "SPORTY" were popular words owners used to describe styling of their '65 Oldsmobiles. Some didn't like the "humpbacked" rear fenders

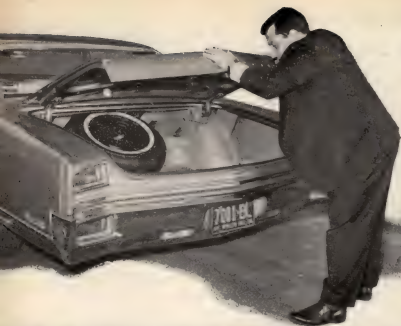
Owners Like

Light Handling	(42.1%)
Floating Ride	(35.0%)
Gutty Power	(31.2%)

But Dislike

Wind Noise	(22.4%)
Careless Assembly	(18.6%)
Curved Windows	(9.8%)





SOME OWNERS WANTED a handle to close the trunk with and one complained about poor spare location and luggage space arrangement. Most owners didn't bother to comment. Styling was generally praised by owners

OLDSMOBILE FEELS DASH is adequately recessed, but owner complaints about reflections from brightwork were common. Instruments are grouped together well and circular speedometer is easy to read. Glove box space is snug



Our test car
rode like a canoe
on quiet water



though, in praising "the exceptionally smooth ride for a car of its weight class." He added, "I've tried it on some pretty rough country roads, too." There were a sizable number of praises for the car's sleek, "sinuous" styling and its "luxurious" upholstery. And not a few owners commented happily about "higher seats," which cradle the back and shoulders.

In answer to our question as to whether or not owners would buy the same car again, 78.6 percent of Olds owners said yes.

Careless assembly and inadequate quality control came in for noisy complaints from 18.6 percent. Typical of the kind of noise was the comment of a New Jersey civil servant who said: "There are many bugs, from outright engineering blunders to careless workmanship." He listed "oil leaks, excess vibration, windshield washers that didn't work, a door handle that fell off, doors that didn't fit, a fan that slipped forward into the radiator during a cross-country trip, lights improperly wired, a leaky trunk, and numerous other things."

Every car builder turns out an occasional lemon, of course. But not many lemon owners have ever equaled the Philadelphia assembler who, asked what he'd like to see changed on his '65 Olds, answered simply: "The owner—me." The 18.6

But he raved
about service at Olds
dealerships on his
cross-country trip



percent who disliked assembly and workmanship compares to Ford and Chevy owner complaints, in the same area, last month totaling 18 and 16.5 percent, respectively.

The praises for Olds performance were backed up by our acceleration tests. In a 360-hp Dynamic 88 with the optional four-barrel, 425-inch V8, we did 0 to 60 in 8.3 seconds by upshifting from Low to Super at about 45. In Drive it took 8.9 seconds. The Turbo Hydra-Matic appeared to up-shift automatically at about 37 mph, although its action is so smooth it's hard to tell.

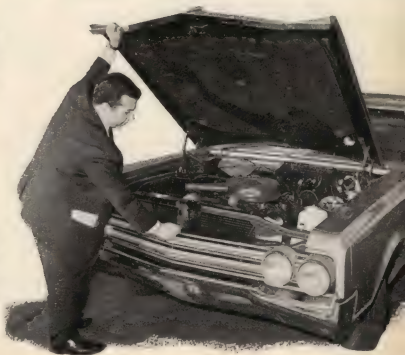
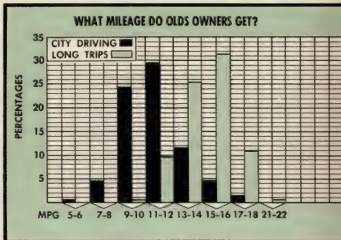
In checking passing speeds, we went from a true 40 to 60 in 4.2 seconds, from 50 to 70 in 4.9.

The North Dakota Oldsmobile owner previously quoted gets 16 miles per gallon [after 1600 miles] on long trips, 10 mpg in town. "But what can you expect," he points out, "from a 310-hp engine?" Not all owners did that well. Poor gas mileage shows up in fourth place on the brickbat list. The fuel chart on p. 97 gives the figures for all the PM owners. Breaking them down, we found the bulk of 88 owners (Jet



CURVED-GLASS WINDOWS were source of many complaints from the owners PM surveyed. Imperfect closing stimulated many of the wind noise complaints. Bare glass, owners reported, can go un-noticed when front doors are swung open in dark

PM'S ACCELERATION AND FUEL tests were run with the Olds Super Rocket engine, rated at 360 hp at 4800 rpm. The fuel figures were respectable while acceleration times were good. Owners put power and performance third on list of Olds praises





EASE OF HANDLING made a hit with owners, who said it's not tiring even on long trips on expressways—probably thanks to the many power assists

Owners were no more disappointed in gas—→ mileage than the owners of most other cars

star 88, Dynamic 88, and Dynamic 88 Delta) got 11 to 12 mpg in town and 15 to 16 on trips, for a 13 or 14 mpg overall average. Owners of the hotter Jetstar I or Starfire generally got about 9 or 10 mpg in town and 13 or 14 on long trips.

As a controlled basis for comparison with other cars, we checked steady-speed fuel consumption with our Tracktest fifth wheel speedometer and electric fuel meter. Here are our results:

Speed	30	40	50	60	70
Fuel mpg	19.51	19.69	17.05	16.30	14.50

Our speedometer was one mile per hour high at 30, only 3 mph optimistic at 70. And we found the circular Olds speedometer more readable than most GM units have been for some time.

You could look for a little more economy as the miles add up →

We got 11.32 mpg overall during a test that was mainly highway driving plus a premium-gas-gobbling series of accelerations. We finished with 1682 miles on the clock.

What did the owners themselves find? Here are their statements, picked to represent the five most popular characteristics of the '65 Olds, with leaders shown first:

"Considered buying a Pontiac, but the Olds handles easier."—South Dakota salesman.

"Like the handling qualities on the expressway."—self-employed South Carolinian.

"Rides very smoothly; I don't get tired driving."—Louisiana salesman.

"Plenty of speed! Really moves out at over 100—I couldn't get all the speed it had, ran out of road."—North Carolina insurance man.

"I like the sleek look; it gives an expensive appearance."—South Carolina plant manager.

"The fine upholstery is easy to keep clean."—Rhode Island barber.

The five most widespread complaints include wind noise, poor assembly, window trouble, poor gas mileage and a glistening dash. Here's what owners have to say:

"Over 40 mph, wind noise makes conversation impossible;

Hope he sold himself enough insurance →

at higher speeds it causes earache.”—New Jersey college professor.

“Windows don’t close properly against whistling wind.”—Rhode Island businessman.

“Assembly is very poor: Air comes in around doors, chrome is loose around windshield and rear window, paint has runs.”

—Kentucky over-the-road trucker.

“Poor check of body construction before delivery.”—Oklahoma oil company engineer.

“Never, since 1930, have I owned a car where so much brute strength was necessary to raise and lower the windows.”—Maryland resort owner.

“Slanted front door and window edges tend to stab you when opening the door; I’ve cut two jackets to date.”—New Jersey contractor.

“Gas usage (8.5 mpg in town after 4350 miles) is excessive.”—Pennsylvania industrial process control manager.

“My engine uses regular, but at 10 mpg in town and 13 overall it isn’t economical.”—Professional Pennsylvania wrestler.

“Bright metal across the dash throws reflections. The stylist who came up with this one should be boiled in oil.”—Washington real estate man.

“The spun aluminum on the dash is very attractive, but also reflects sun into your eyes.”—Nebraska florist.

There’s more to be said on the bright side, however; here are samples from owners’ praises numbered six through ten:

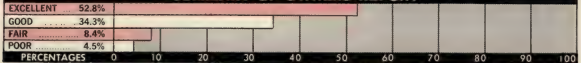
“I don’t like bucket seats, but my Delta 88 has a front arm rest that can flip from almost-buckets to a regular style seat.”—Maryland postal garage worker.

(Please turn to page 232)

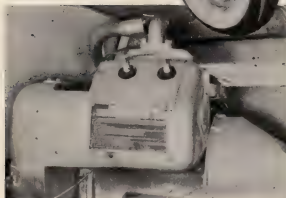
← “We don’t find this trouble on warranty claim records,” says Olds

← “It’s adequately hooded,” says Olds

SUMMARY OF OWNERS REPORT



Best-liked features		Least-liked features		Is Oldsmobile family's only car?	
Ease of handling	42.1%	Wind noise	22.4%	Yes	52.5%
Ride	35.0	Assembly and workmanship	18.6	No	47.5
Power, performance	31.2	Windows	9.8	Make of other car	
Overall design	28.5	Gas mileage	9.3	Chevrolet	10.4
Upholstery	18.0	Chrome on dash	7.1	Another Oldsmobile	9.8
Seats	13.7	Inaccurate gas gage	6.6	Ford	6.0
Comfort	13.1	Rattles and squeaks	6.6	Rambler	3.6
Transmission	11.5	Visibility	6.0	Falcon	3.3
Dashboard	8.7	Lack of roominess	4.9	Volkswagen	2.7
Driving ease	7.7	Rear-end styling	4.9	Pontiac	2.7
Roominess	5.5	Transmission trouble	4.4	Corvair	2.7
Front styling	4.4	Instrument placement	4.4	Make of car traded in	
Instrument panel	3.8	Lack of headroom	3.8	Oldsmobile	55.3
Roadability	3.8	Instability	3.8	Chevrolet	7.7
Dependability	3.8	Carburetor trouble	3.8	Pontiac	3.8
Brakes	3.3	Rear wheels show too much	3.8	F-85	2.7
Fastback styling	3.3	Lack of chrome strip	3.8	Rambler	2.7
Lighting	3.3	Styling	3.8	Chrysler	2.7
Steering wheel	3.3	Suspension	3.3	Ford	2.7
Visibility	2.7	Leaks	3.3	Dealer service	
Quietness	2.7	Paint	3.3	Excellent	61.7
Interior	2.7	Fuel economy		Average	29.0
Chrome	2.7	About as expected	66.1	Poor	7.7
Color	2.7	Better than expected	6.0	Would you buy from him again?	
Rear styling	2.7	Not as good	20.2	Yes	61.7
Oldsmobile decision based on		Other car considered, if any		No	8.7
Previous Olds ownership	48.1	None considered	48.6	Buy another Oldsmobile?	
Styling	21.3	Pontiac	20.2	Yes	78.6
Price	9.3	Buick	12.6	No	7.7
Power, performance	8.2	Chevrolet	12.0	Undecided	13.7



Bubble Car for Shopping

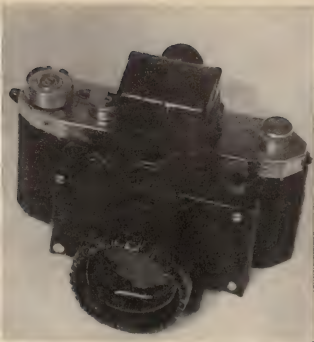
The four-seat "Citycar" is designed for heavy traffic: Its 26-foot turning circle eases parking; its rear end is crunch-proof (thanks to outside-mounted spare), and its body panels unbolt quickly. The 90-inch Wisconsin air-cooled Four burns any grade fuel, even kerosene, and gives a 60-m.p.h. top speed. Designer Leopold Garcia of Bernallio, N.M., plans production in Germany next year. Price: \$995.

Domed Roof Formed of Bowstring Trusses

Twenty-six wooden bowstring trusses alone support the dome of this storage building in Wyandotte, Mich., which employs a rooftop conveyor to spill bulk chemicals onto a huge mound on the 180-foot-diameter floor. Trusses were put up

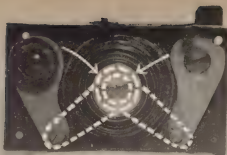
two at a time, as shown. They were anchored on a concrete retaining wall and joined at the top with a 10-foot steel compression ring. Designed by the Weyerhaeuser Company, the structure is said to be able to withstand 75-m.p.h. winds.





Camera Has Built-In Telephotos

We recently previewed a hand-made prototype of the Multifocal Camera, a 35-mm single-lens reflex that gives four focal lengths (photos, right). To select a focal length, you flip either or both of two knobs, each of which moves an auxiliary lens (top right) into place to extend the focal length of the camera's normal lens. Inventor Leonard Westphalen says his system is more compact and simpler than quality zoom lenses.—Arthur Maher



Electric Loader

Claimed to be more efficient than hydraulic power, electric motors operate a front-end loader with a 40-ton dipper, rooting it through earth and rock, dumping the load and powering the steering wheel. The earth-mover is made by R. G. Le-Tourneau, Longview, Tex.



New Look in Keyless Locks

They are pick-proof and child-proof. And you can change the combination whenever necessary

IF YOU'VE EVER come home a bit late and found yourself without a front-door key, you'll appreciate one of the big advantages of the new keyless locks. Instead of having to rouse the little woman, all you do is punch a few buttons and, *click*, you're inside.

The makers of these locks point out other advantages, too:

- Since there's no keyhole, the locks are pick-proof. Skeleton keys are no threat.

- Combinations can be changed, should the secret of your lock be compromised. There are thousands of possible combinations to choose from.

- Pushing buttons is a lot easier than fumbling for a key when your arms are laden with groceries and the like.

- The locks are child-proof and can be used on cabinets containing sharp tools, poisons, medicines, etc.

The Simplex Corporation has had a cabinet lock on the market for over a year. The same basic push-button mechanism is used in Simplex's two new door locks. They can be installed in wood or hollow metal doors from 1 $\frac{3}{8}$ to 1 $\frac{3}{4}$ in. thick (and up to 2 $\frac{1}{2}$ in. with an adapter kit). Both models are rim-mounted and can be installed in either right- or left-hand opening doors.

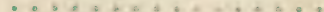
Another outside door lock is the Preso-Matic, which features 10 numbered buttons, four of which must be pressed in correct sequence to open the lock. The bolt and locking mechanism are reset by hitting the reset button.

A push-button padlock, boasting of 1000 different combinations, also is available. All it takes to change the combination is a screwdriver and a few minutes' time.

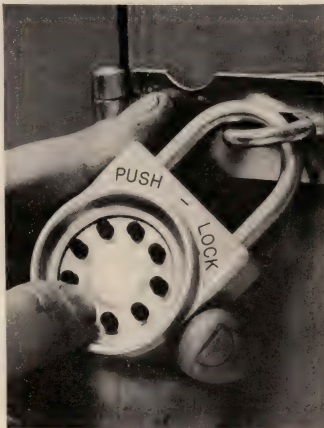
Car keys may be on the way out, too. Right now at least one company is working on combination ignition locks.

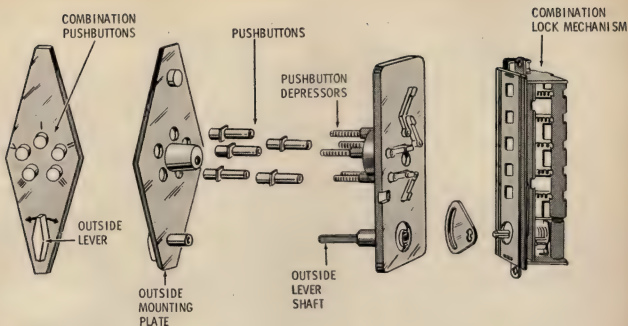


THE SIMPLEX lock is opened by pushing, say, three different buttons in a given sequence. Then you turn the small knob to the right to pull back bolt



VULCANA padlock eliminates the problem of lost keys and is easy to open in the dark. The maker says the lock offers 1000 possible combinations





THE HEART OF THIS lock is the combination chamber (far right), which permits setting a new combination without the use of tools or removing lock from the door. From one to five numbers can be used in combination

UP TO 10,000 different four-number combinations are incorporated in the works of the Preso-Matic

FLIP small night latch on inside plate of Preso-Matic and the mechanism is made inoperable

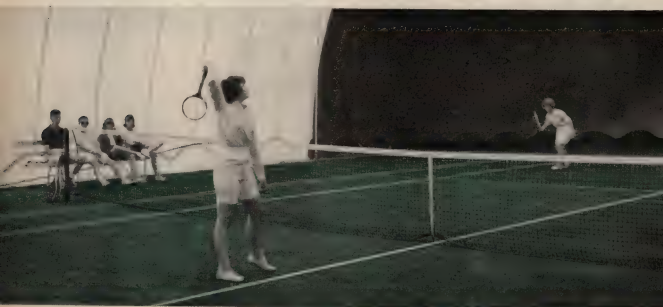
CABINET lock: Nylon buttons don't show wear and thus give away combination to snoopers





LAWNS THAT NEVER NEED MOWING: Colored gravel replaces grass on many lawns in Sun City, Ariz., retirement-home community built by Del E. Webb Corp.

CHEMISTRY IMPROVES ON NATURE: Tennis courts covered with synthetic vinyl turf are said to have better playing characteristics than those of real grass





Fresh Ideas For Easier Homeowning

Green gravel, plastic grass and adjustable weatherstrips are a few of these worksaving features

By Richard Dunlop

PARADOXICALLY, some of the youngest ideas in easy living are coming out of houses and communities built for the aged.

Since about the mid 1950's, research agencies, both commercial and non-profit, have been taking a long, hard look at traditional housing concepts to find out what changes could, for example, save Grandpa a fainting spell caused by stooping to plug in a lamp. Or help him in and out of the bathtub without risking a dangerous fall. Or grant him the pleasures of a luxurious green lawn without maintenance work.

But the result has been just as beneficial to younger home buyers as it has been for the rocking-chair set. Young marrieds, for example, were quick to see that a house made safer and more convenient for an older person is safer, too, for a toddling child. And what housewife will pass up a chance to avoid many of the deep-knee bends associated with housework? Perhaps for that reason, Frank Mackle, a Florida-based retirement home builder, reports that many of his buyers are young married couples.

Inevitably, one area that has come under the innovator's critical eye is the lawn. "That lush, green grass is a joy to behold," he admits, "but it requires a lot of work." Result: artificial grass.

In one Arizona housing development, buyers can choose between real grass and low-maintenance lawns consisting of patches of green gravel. The gravel is

BELOW, SURFACE OF THE TURF resembles tiny blades of grass. This material is suitable for year-round exposure to weather. It's set in place with epoxy





KITCHENS ARE EASY to clean in prefabricated houses offered by National Homes Corp. Here, a housewife washes a cabinet drawer molded from plastic

nothing more than concrete aggregates treated with dye. Gardening buffs may gnash their teeth in horror, but the effect is realistic enough for the elderly suburbanite who prefers a Saturday afternoon on the golf course, to one spent behind the lawn mower.

On the other side of the country, in Boston, the American Biltrite Rubber Co. has raised the pseudo-grass business to a science. It has developed a green vinyl material called Neo-Turf. At first glance, this product looks like a green carpet. But closer examination shows a surface made up of tiny grass-like blades. Spread Neo-Turf over a patch of soil, and you have a "lawn" without weeds, without gophers, that never needs mowing, watering or fertilization.

For over a year now, students at the Forman School, in Connecticut, have played tennis on a court of vinyl grass. Another such court is to be seen at Montclair, N.J. YMCA. Experienced players judge the courts "excellent." Footing is sure, permitting fast, sharp turns. And, because the surface is smoother than grass, balls tend to bounce truer.

Stepping back inside the house, we find the quest for the good life shunting aside many old concepts of design and layout. In the kitchen, for example, easy-to-clean plastics now appear on cabinet facings, as well as countertops, and are even being used inside the cabinets. By lowering wall cabinets to 63 inches from the floor,



BATHROOM OF RETIREMENT HOME has grab bars near tub to help bathers climb in and out safely. At left of photo is built-in seat for use while dressing

and raising under-counter shelves to 27 inches from the floor, we eliminate many of the daily bend-and-stretch calisthenics that have given not only Grandma, but Mom and daughter, many a backache.

Moving to the sink, why not place it six inches lower than the standard 34 inches? By so doing, and adding a desk-like knee hole, we let Mom sit down while washing the dishes.

Other changes being made in the kitchen include making stove controls larger and easier to read. Some manufacturers have begun locating the controls at eye level. Again, less stooping for Mom.

What about the bathroom, which is one of the most dangerous areas of the home? The safety measures being introduced here are as much a boon to children and pregnant housewives as to old timers.

One of the most common household accidents, particularly for senior citizens, is to slip and fall in the bathtub. Last October, this happened to former President Harry S. Truman, resulting in two broken ribs, shattered eye glasses and lacerations of the right eye.

Several changes are being made to lessen the danger. For example, some builders install grab bars on the wall behind and/or at the head of the tub. Another idea being tried by the Kohler Co. is to break up the smooth surface on the bottom of the tub by texturing it. The aim here, of course, is improved footing.

New York University's Institute for



A TURN OF THE SCREW expands vinyl insert of this door-bottom weatherstrip to maintain tight seal. Device represents trend to simplified maintenance



NO BEND, NO STRETCH is the aim of retirement-house kitchen planners. Lights pull down and cabinets and ovens can all be reached without stooping

Physical Medicine and Rehabilitation, in designing retirement homes for St. Petersburg, Fla. builder Joseph Rosati, suggested surfacing the bathroom floor with terrazzo containing carborundum chips to keep feet from slipping.

Safety experts and doctors maintain that a non-skid shower with a seat and hand spray is a lot safer than a conventional tub. But, since most people, young and old alike, want a tub as well as a shower, Rosati provides a flexible hand spray and a built-in seat for the tub.

Other changes taking place in the bathroom are placing a built-in seat next to the tub, to be used while drying or dressing after a bath, or re-locating the toilet next to the tub so its folded-down seat can be used for the same purpose.

Because older people spend much time in the living room, it takes on new importance. Plans for the House of Freedom, designed by architect Robert B. Waring and co-sponsored by the American Plywood Association, the American Association of Retired Persons and the National Retired Teachers Association, call for a minimum of 140 square feet of space in the living room.

Built-in bookshelves and game storage space—previously thought proper only in the family room—are specified, along with cathedral or beamed ceilings to save construction costs while creating a feeling of spaciousness. Sometimes, sleeping alcoves are added to the living room. The alcoves

give more space during the day, and can be screened off at night as a "guest room."

Geriatric research is also making the bedroom more convenient. A minimum clear space of 18 inches on three sides of the bed is considered necessary for easy bed making, and five feet of floor space should be provided on one side of the bed for possible use of a wheel chair or dining cart. For younger housewives, that extra space means the bedroom can double as a sewing room.

A handy change being made in closets of retirement homes is to place some of

SELF STORING SASH are now appearing on storm doors, as well as windows. Housewives need only raise a window sash to allow use of screen panel





COMBINATION LAWN has broad strip of green gravel bordering a patch of natural grass. Gravel blends visually with the grass, prevents it from spreading into the adjoining flower garden

the clothes bars at half the usual height, which would also bring them within easy reach of children.

No aspect of house design, no matter how insignificant it might seem, is ignored in the quest for safer, more carefree living. Researchers have even gone so far as to prove that hexagonal or octagonal door knobs are easier to turn than round ones, although some elderly people prefer lever-type openers.

Doors in retirement houses are made at least three feet wide and, except for exterior doorways, have no raised thresholds. Hallways are made four feet wide. These dimensions facilitate passage of a wheel chair. But they also permit easy moving of furniture and appliances.

Have you ever stopped to realize how inconvenient the usual placement of electrical outlets on the baseboard can be? In retirement homes, some builders place the outlets at waist level, where they can be reached without bending over. Other builders place the outlets 18 inches above the floor, which makes them almost as accessible, but doesn't offend the buyer's sense of tradition. Switches, too, are being relocated. Placed a foot under the usual four feet, they can be operated by children and old folks with greater ease.

To prevent accidental falls, experts insist that all floors in a house should be made of non-slip unglazed tile, cork, composition flooring or wood. And, for the comfort and good health of old people and kids, floors should be insulated.

Another neat safety trick, from color consultant Jo Ann Zimmerly, is to make stairs easier to see by painting treads and risers different colors. And, to improve

footing on exterior or basement stairways, some builders coat the treads with a mixture of sand and deck paint.

Finally, there's the subject of home maintenance. Manufacturers have long produced innumerable materials, such as plastic laminates, prefinished sidings and longer lasting paints, that lessen the heavier maintenance chores. But recent years have seen an increased emphasis on products that simplify the day-to-day nuisance jobs. For example, Central Metal Strip Co. recently introduced an aluminum-and-vinyl weatherstrip for door bottoms, which permits quick readjustment of the seal should warpage of the door or wearing of the threshold admit a cold draft. All you do is turn one of several adjusting screws. This squeezes the sealer strip, pushing it tightly against the threshold to renew the lost contact.

Fortunately for us all, researchers continue their search for ways to make life easier and more pleasant for the elderly. And, in view of what's been accomplished so far, we can expect tomorrow's architects to borrow more and more heavily from retirement house designers. But, looking at the convenience and safety of today's senior-citizen housing, who among us will object?

After all, says Alexander Kira, Assistant Director of the Cornell University Housing Research Center, "the aged are no different than the rest of us, and the house properly designed for an aged person would, in most respects, be equally desirable for his grandson. . . . We may find that paying attention to the needs of the elderly might result in good housing for us all." ★ ★ ★

Four-Finned Ferry

Powered by turboprop engines, a new Navy cargo plane can carry 40 passengers or 7½ tons of parts and land on carriers deployed in forward areas.

It will increase both the range and capacity of supply aircraft, with a range of 1300 nautical miles at a maximum cruising speed of 300 m.p.h.

Made by Grumman, its Navy designation is C2A.

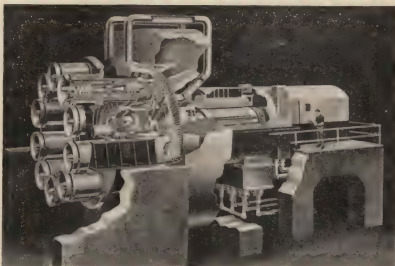


Ten-Jet Generator

Ten aircraft-type jet engines arranged in a circle, will drive a generator now being built by General Electric Company.

The jets exhaust into a turbine, driving a hydrogen-cooled generator at 1200 r.p.m.

The 100,000 - kilowatt unit will be installed this spring at the Cincinnati Gas and Electric Co. It's said to be the first cylindrically arranged jet turbine.



12,000 Bits

Over 12,000 pieces of wood were inlaid in a 36-inch tabletop by a Texas teacher to form a map of Texas.

H. H. Wright of Brenham, Tex., who made the table, got a piece of wood from an historic spot in each Texas county and then cut the wood to the shape of that county.

Among the wood bits are pieces from the rafters of the Alamo (Bexar County) and from a covered wagon (Lipscomb County).

All the work was done with a pocketknife, razor blade and small chisel.



Want to Be a



IT WAS SOME 25,000 years ago that a Cro-Magnon sportsman fashioned a hook from the bone of Teraton, attached it to a gut line and put aside the problems of meat gathering for a day of angling in a forest lake.

Fishing is still basically a matter of putting a hook into the water and hoping that some fish will be foolish or hungry enough to bite it. And the universal appeal

CURVED BUTT on this fishing grip by Magnus Corp., 100 Naylor Ave., Livingston, N.J., rests against the body to prevent fatigue in fish-fighting. The flat sides eliminate rolling, and clip on the side lets the fish take the line in controlled stages



PANFISH KNIFE is specifically designed for crappies and bluegills. The short, triangular point is excellent for gutting and cleaning these difficult smaller fish and the serrated back is for scaling the fish. It costs only \$1.50 from Kinfolks, Inc., Perry, New York



WEED DEFLECTOR on the Sneaky Neeky is a pliable metal foil that depresses with pressure to expose the hook. The trailing tails give the lure an erratic action in the water. It is priced at \$1.49 from TVL Products, 630 Cedar Ave., Uniondale, N.Y.



More Compleat Angler?

to men of high and low station in every corner of the world is the return to the primordial, the reflective calm that is part of spinning in a lake or dropping a fly in a mountain stream.

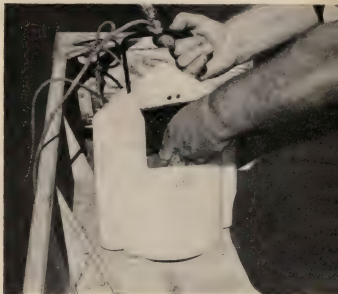
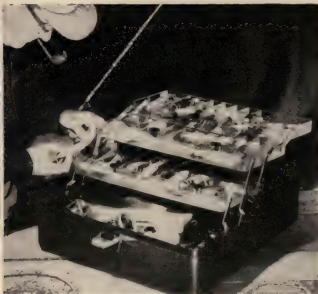
But the equipment—as a visit to any tackle store will testify—has changed and multiplied. And most of it has added something to the sport. Fiberglass has made it possible to have a strong, top

quality rod at a moderate price. The close-faced spinning reels have made it easy for a novice to cast like an expert. A little thing like a hook disgorger has taken a lot of the cussin' out of the sport.

Lures seem as numerous as asteroids and just as mysterious. But they catch fish. Most are sleek and colorful and some of these are famous, but there are others like the Texas Hootie, which looks like an

NIGHT FISHERMEN will welcome a tackle box that lights up. Made by Old Pal, Inc., Lititz, Pa., and priced at \$24.95, the box has three fold-out trays of clear plastic equipped with four small lights that operate off ordinary flashlight batteries

TROLLING BUCKET for live bait has air chambers that float it horizontal with the door out of the water, making it easy to reach in for bait. Holes in the bottom admit fresh water. It sells for \$4.95 from Cosom Corp., 6030 Wayzata Blvd., Mpls., Minn.



SIGNALLING A BITE when fishing in the dark, a plastic rod handle is equipped with a bulb and penlight battery. After line is cast it is pulled back and inserted in a notch on a small cam. A tug on the line moves the cam, activating the battery, and the light flashes in the handle. It is priced at \$4.95 from Kamp Products, 918 Blackhawk, Rockton, Ill.





FIFTEEN TOOLS are combined in the Fisherman's Pliers, ranging from a knife blade, wire cutter, hook hone to a unique device for opening split shot. Available from Kilmer Co., 1504 Dodge, Omaha, Neb., and Corcoran, Inc., Stoughton, Mass. for \$5.95



BARBLESS HOOK features a locking device to make it difficult for a fish to throw the hook once it has been set. Named Kant-Thro and priced at \$1 for a half dozen by Farrell Specialties, Neosho, Mo., it comes in sizes for lunkers and for pan fish



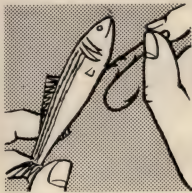
LINE LEADER CONNECTOR is a tiny plastic device to eliminate tying leader to the line. Line is doubled and slipped through a sleeve (above right) and over a slot in an insert. Leader is looped over opposite slot and the insert is pulled tight into the sleeve. They cost 49 cents for six from Meinzingen & Rade Co., Livonia, Mich.

old mop on a hook, that are local legends. Most new lures are oddball gimmicks or copies and innovations of existing lures. Some of the innovations seem practical. The Fred Arbogast Co., for instance, is adding a flocked (furlike) finish to the Jitterbug and the Hula Popper, and the Hula Dancer now has weedless hooks.

Knowing depth and water temperature adds to the pleasure of fishing and Vexilar



FLY TYING FOR BEGINNERS is made easy and inexpensive with a kit that is offered by Worth Fishing Tackle Co., Stevens Point, Wis. for \$3.25. The kit includes a metal vise, cement, thread, a wide variety of feathers, and step-by-step instructions



BOBBY PIN HOOK is a barbed pin on a hook that is inserted into the body of live bait such as minnows or crickets. Six hooks cost 50¢ from DACC0 Prod., Ridgecrest, Colo.

Engineering Co., Box 6286, Minneapolis, Minn. has put out a Fish Finder for \$3.95 that shows temperature and also records depth through water pressure on the instrument. Practical items like this will always find a corner in the tackle box.

It is common to scoff at fishermen's gadgetry, but Mr. Cro-Magnon would have happily swapped his bird bone for a weedless hook.—Stuart James

Flying Mattress

High-altitude cloud seeding is being studied with the aid of a rectangular stickless kite that carries scientific instruments up as high as 14,000 feet.

Ordinary kites are too fragile and balloons, aircraft and parachutes won't stay put. But the stickless kite—made of nylon and dacron—is stiffened by the wind. Its designer, Domina Jalbert, calls it "a bunch of wind socks sewn together." The smallest size (7 pounds) can lift 100 pounds, and the largest several times more.



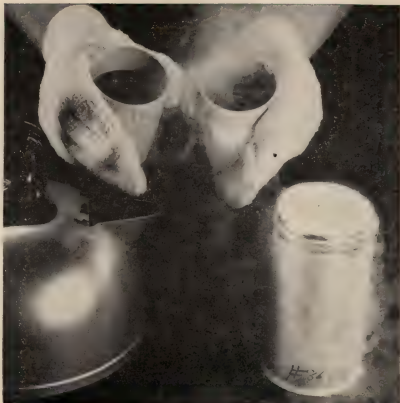
For Hot or Cold

Plastic drinking cups, which remain strong and "squeezeable" even in extreme heat and cold, demonstrate the properties of General Electric's new PPO polymer.

The cup at the left in the photo is filled with boiling water (212 degrees F.) while the one at right is full of liquid nitrogen (320 degrees below zero).

Among products which can be made from the new plastic are surgical instruments which are lightweight and can be sterilized repeatedly.

The plastic is a product of a new chemical technique, "polymerization by oxidative coupling."



Splashy Ending to Roller

Snowless summers don't stop Norwegian jumpers; they don wheels boards and land in lake

By Pat Snook

IT WASN'T WARM when I visited Oslo, Norway, last August, but it wasn't snowing either, so I was a little startled when a friend asked if I was going out to watch the ski jumping.

"Without snow?" I asked.

"Sure, we put wheels on skis, extend the jump out over a lake and jump in."

I should have figured. After all, this was

the land of the Vikings, and when hard-headed Norwegians make up their minds to do something, well that's it. No snow wasn't going to stop them from skiing.

Sure enough, on Sunday they jumped. At the edge of a lake they had erected a special jumping ramp. About 200 feet long, with a vertical drop of 100 feet and the end positioned about 20 feet above the water's edge, it looked formidable.

The ramp itself was wood, with a tubular steel understructure. Down each side was a raised track about an inch square. At the top were metal handrails.

The swimming-suited skiers climbed up

SKI RAMP is wood with tubular-steel understructure. Inch-high side runners form track. Two-hundred feet long, ramp has vertical drop of 100 feet

SKI JUMPER assumes same positions on rollers as he would on skis, crouching as he comes down ramp and windmilling arms for balance as he leaves it



Ski Jumping

and positioned themselves on their "skis," nothing more than 2-foot-by-6-inch-boards with nylon rollers. Raised abrasive-surfaced blocks served as footrests.

In position, each man gave a mighty heave and rocketed down. It looked like an invitation to disaster just to stand on those unstable things, let alone go down that ramp, but no serious injuries occur.

Each man assumes the usual crouch going down, then soars out at the end, his arms windmilling. The skis drop into the water, and the skier tries for form and distance. Some drop like watermelons on a sidewalk, but most are graceful.

SKIER'S FORM, as well as distance, is judged on each jump. Judges sit in rowboats out on lake and use large floating ruler anchored at side of run



ROLLER BOARDS have no foot straps, just skidless matting on raised wood blocks. About two feet long, boards are equipped with four nylon roller wheels

INJURIES are rare, and usually minor. No one has been hurt coming down ramp, only from landing in water in awkward positions, result of poor jump





'Beartrap' Snags Helicopters on Rolling Deck

How to land 10-ton helicopters on the rolling and pitching deck of small destroyer escorts was solved by the Canadian Navy with a winch and "beartrap."

A cable with a quick-attach probe is run through the beartrap from the winch.

After it is attached to a mating probe on the base of the hovering helicopter (it's pulled up on a nylon cord, dropped from the cabin, photo 2), the winch reels the aircraft down until the probe enters the beartrap where it is instantly gripped (3).

Mechanical Cowpoke Goes After the Strays

Another step in the taming of the West has been taken by a Nebraska rancher who has built a mechanical cowpoke.

The rig is really a wheel-mounted corral that's swept over the range by a truck, car or even a fast tractor. With its "jaw"

spread wide open (right), the machine is pushed toward the animal that's to be caught. Hydraulic pistons then snap the wing panels shut, trapping the animal.

Rubber bumpers on the corral protect the animal from injury.





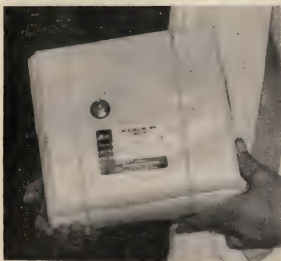
A Four-Wheeled Motorcycle?

Balancing a car on two wheels is Euclides Montiero's idea of an amusing way to pass the time. The Brazilian stunt driver's agile vehicle is a Volkswagen Kombi, supplied by a local dealer. It's stock except for a locked differential.



Trunk Converts for Canines

A convertible "sunroof" in the trunk of this Tokyo car lets Fido enjoy the fresh air. This lucky pointer's generous master has also lined the inside of the trunk with soft felt, providing all the comforts of a giant doghouse on wheels.



Balloon Antenna Folds Up

This Mylar antenna mast inflates to 50 or 100 feet, and folds into a small package when not in use. It's for troops in the field, where rough terrain may require a tall mast, but would make it hard to haul lengths of conventional mast. The self-supporting air-column structures retain low pressure for at least two days. A pump, cylinder or good old-fashioned breath can be used to inflate the mast, made by Kearfott Division of General Precision Aerospace, Little Falls, N.J.

Shop Short Cuts with New Magnetic Forming

"INSTANT MAGNETISM" was until recently only a laboratory curiosity. Today, it's a useful metalworking tool that's replacing many welding, brazing, drilling, shaping and assembly operations.

In one typical application, the following work is done in microseconds on a short length of 4-inch aluminum tubing: One end is bent back into a wrap-around flange, part of the tube is expanded to a new size and, simultaneously, two large burr-free holes are punched through the tube wall. This single operation formerly required two spinning and two blanking operations plus trimming and deburring.

The versatile machine that does this and a hundred other jobs is called Magneform, a product of the General Atomic Division of General Dynamics. The machine stores up electrical energy that is discharged as a pulse through a wire coil, creating a split-second magnetic field around the coil. An opposite current is produced in the metal being worked on, and the metal is violently driven away from the coil and against a die. There's a sharp *Snap!* and the work is done.

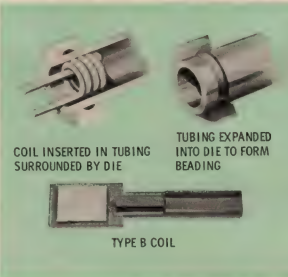
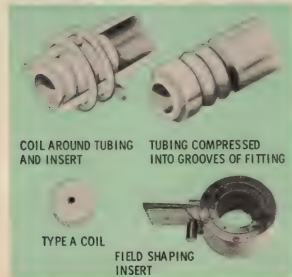
Magnetic forming works best on light to medium-gauge materials having good electrical conductivity such as brass, copper and aluminum. It's effective in the joining of metallic and nonmetallic parts, as in attaching an aluminum dial to a plastic knob. It also provides an efficient, one-shot assembly method in the production of small transformers, loudspeakers and similar units.—*Thomas E. Stimson Jr.*

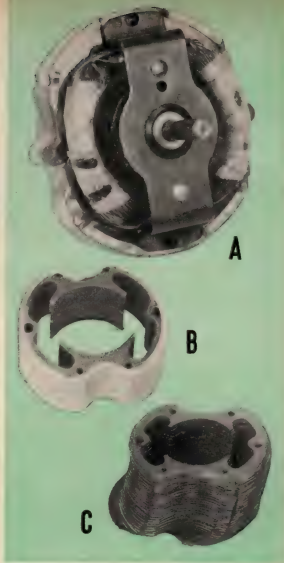
MAGNETIC FORMING is especially useful in joining parts made of different materials. At right, an aluminum band is being attached to end of a ceramic missile nose cone. Pressures as high as 50,000 p.s.i. can be produced



THREE basic shapes of coils are used. Type A (below) surrounds work and produces compression because work tends to move away from magnetic field

TYPE B COIL fits inside the work and produces a powerful expansive force. As a result, the work is slammed into the die surrounding it and is reshaped

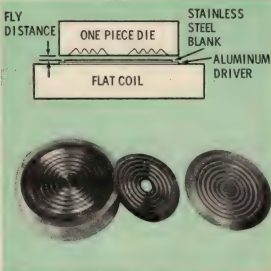
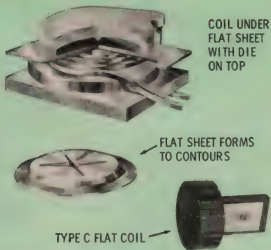




MAGNETIC forming machine crimps aluminum band around motor assembly (A). It also binds loose motor laminations (C) with band (B) in a single operation

TYPE C lies flat and is used for contouring metal sheet into shape of die above it. Forming works best with materials that are good electrical conductors

BECAUSE stainless steel is poor conductor, aluminum "driver" (bottom, right) was used in shaping of the steel diaphragm (center). Die is shown at left





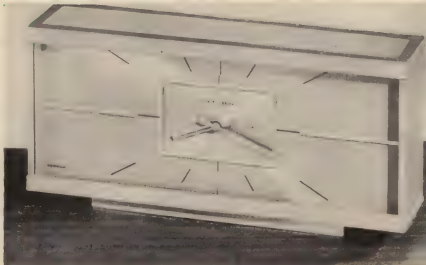
SEWING MACHINE makes any of 200 stitch designs automatically. Simply insert interchangeable double-profile discs for desired pattern. Deluxe Elna model costs \$379. By White Consolidated, 11770 Berea Rd., Cleveland, Ohio



BATH BRUSH scrubs and massages, reaching all areas easily. Soft brushes on plastic handles draw from side to side or up and down. Adult model is \$5.95; children's, \$4.95. Available from Worthy Products, 303 Fifth Ave., New York

New for Your Home

SOLAR CLOCK needs no winding; its energy is the sun. Cells in the top charge batteries while a sensitive accumulator stores excess energy to run clock even without sunlight. Silver-cased model costs \$135. Elgin Watch Co., Elgin, Ill.





FOAM TAPE sticks onto the protruding portion of any chair back and prevents damage to walls or other furniture. Tape's adhesive back won't mar chair finish. Simply cut 5 by 5-inch sheets to size. Pack of 3 sheets is 49 cents; Neatape, 457 Broadway, New York



PAD HOLDER for steel scouring pads installs conveniently on any surface. A magnet holds pad out of sight but easy to reach. Because pads are air dried, they don't rust, and thus last longer. Units are 79 cents each and come with a pad. Made by Maggie Magnetic Inc., 111 Marion Street, Paterson, New Jersey.

BREADBOX compactly houses rolls, etc., on tilt-up shelf above large loaves. The magnet-latched door snaps shut with elbow nudge and doubles as a cutting board, right where one is needed. In chrome, box is \$8.98. By Beauty-Ware, 225 42nd St., Brooklyn, 32, New York



ELECTRIC UPHOLSTERY SHAMPOOER works on four-battery motor. Unit includes globular brush for large areas, a spot-cleaner for touch ups, plus spray can of cleaner. Light and portable, it's safe even on brocades. Price: \$9.95 from Empire Brushes, Port Chester, N.Y.





Loaded Motorcycle

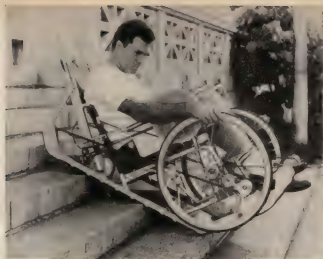
Out in California, where they do things up brown, Harland "Bud" Curtis bought a new Honda and made a rolling livingroom of it. The motorcycle boasts TV (it locks out when motor runs, to comply with law); AM radio; cigarette lighter; brake lights; turn lights fore and aft; saddle bags. The cost of all those extras? Only \$445.

Mechanical Goat Gulps Leftovers from Thousands of Meals a Day

What happens to all the table scraps and trash from the 15,000 to 20,000 meals a day served at several World's Fair restaurants? At each, leftovers, including paper plates, make an eight-ton pile daily—enough to fill an 80-cubic-foot garbage pail. Instead it feeds the maw (below left)

of a mechanical monster—the Somat waste handler. Trash hits a spinning disc studded with teeth. Soft material is chewed to pulp; bottles, tins, spoons, etc., are spun off. The pulp, squeezed dry in a helical extractor, is then jettisoned via chute—at 80 percent less bulk.





Stair-Climbing Wheelchair

Faced with a curb or step, the occupant of the wheelchair shown here simply retracts the rear wheel and lowers a frame carrying a nonskid belt. The belt grips the steps, enabling occupant to wheel himself upstairs backward and downstairs forward. The device was invented by a Miami Springs airline mechanic.



Aircoupe Reborn

With an improved 120-m.p.h. cruise, 445-mile range, and climb rate of 640 fpm, the renowned Alon Aircoupe is back in production again. The new two-place Aircoupe has a ceiling of 17,500 feet, boasts a sliding bubble canopy and soundproof cabin. Famous old pedal-less rudder control is optional. Price starts at \$7825.

Practice Bowling Setup Has Ball Return

Swinging pins that set up at the end of a gymnasium practice bowling lane, make an ideal instruction tool for beginners. Even better, a simple, swinging weight behind the pins stops the ball, backs off from the impact, then comes back to shove the ball up the alley again to the bowler.

The lane, pin rack and ball-return can be built of the simplest materials by anyone. Plans for the entire rig are free for the asking. Write to: Bowling Lane Plans, Public Relations Department, Brunswick Corporation, 632 South Wabash Avenue, Chicago, Illinois 60606.



How Big City Cabbies



To these professional drivers, making time in traffic is a game—and they set the game's rules

By Alex Markovich

I'VE BEEN MAKING better time in traffic lately. That's because some of the best city-type drivers have been teaching me. I've been pumping cab drivers for hints—and usually they're happy to oblige.

Take that time in mid-Manhattan, when my cab was pulling up to a red light. The front spots were taken, one by a big Olds, the other by a Corvair.

The driver, a veteran of 22 years, asked me, "Which one do you think will pull away first?" Before I could answer, he nosed in behind the Corvair.

The light changed, and the Corvair was three car lengths in front before the Olds even started to move.

"I can call 'em nine times out of ten," he said. "That Olds had an out-of-state license plate. When I see one, I figure the driver doesn't know the way. He'll drive slower, and may make sudden stops or turns without signaling. And he may not be used to big-city traffic.

"There are other things to watch for," he continued. "A man is a better bet than a woman. A young driver is usually wider awake than an old guy."

It seems the car make is important too.

"I'd rather get behind a Pontiac or Chev than a Rambler or Buick," the cabby said. "A sports car or hot rod is a sure thing. Foreign cars, even little economy jobs like VWs, are okay. So's a small pickup or panel truck. Get behind a cab only if he has a fare. If he's cruising, he won't make any time."

Another driver added: "You can peg a driver just by watching him a couple of minutes. Is he sure of himself? Does he look alert? Or is he busy gabbing with his wife or watching the curvy blonde across the street?"

Another hint he gave me: "Don't pull up too close to the car ahead. Leave room so you can pull around if he decides to double-park or drop off passengers—or stall."

Which lane is fastest? When traffic is moving on a wide street, usually the right, drivers agree. The left one gets clogged by left-turn traffic. But on some streets, double-parking is a problem in the right lane.

A good rule to follow when you're about to cut across a one-way street is to stay in the lane opposite the direction of the cross traffic.

One driver suggested it's better to stay toward the right when going straight through an ordinary intersection. This gives oncoming cars less chance to make a left turn across your bow and cut you off. "Once one car makes a left turn in front of you, all the others follow him,"

Get You There on Time



he said. "This way, even if he does turn in front of you, you can go around behind him without losing speed as long as nobody's turning behind him."

Sometimes cabbies stay on the right lane even when they plan to turn left. The left lane quickly clogs up, but meanwhile they scoot around on the right and into the middle of the intersection before the light changes.

"If there are two lanes, why not use them both?" asked one driver. "But before you turn, make damn sure the guy on your left isn't going straight."

Each street has its own traffic pattern, which may change at different times of the day. If you travel the same route often, it pays to learn this pattern. Sometimes it's wise to avoid problem streets, even by going a little out of the way.

The same strategy, I found, holds true on highways. Each develops its own flow pattern, depending on exits, merging traffic or lanes narrowing or ending.

"That's why you can't outrun a cop," said a salty, hard-driving old cabbie from Brooklyn, who seemed to know from bitter experience. "Cops know their beats inside out, so they make better time."

To study a traffic pattern, sight in on cars in other lanes and watch their progress compared to yours. Sometimes a seemingly slow lane may be best. I remember a Detroit cabbie switching to the right lane of an expressway even though he knew another expressway would merge

into it within a quarter of a mile. Everybody else knew it too—and left the lane wide-open for us.

Mirror Trick

A young college student who drove a cab part-time came up with this advice: To move to a right lane on a crowded parkway, don't crane your neck looking for an opening in the traffic.

"It's amazing how fast the holes close up when other drivers know you want to switch lanes," he said. His trick was to temporarily tilt his rear-view mirror so he could see the right lane without turning his head. "The best time to change

"HEY, YOUR TIRE'S FLAT!" It's a corny trick, but this cabbie swears it works on city hot rod roadhogs





A CLEVER WAY TO CHANGE LANES: Tilt the mirror, so other drivers don't see you looking for an opening

lanes," he went on, "is when traffic first starts moving after a stop. There's always someone slow on the accelerator."

He checked his mirrors often while he drove. "If you always know who's alongside and behind you," he said, "you can change lanes fast when you need to."

Should you tailgate? Cabbies agree sometimes it's unavoidable. "You leave a car space ahead of you and some wise guy'll always squeeze in," one said. "To tailgate safely, look through the windows of the car ahead or even around the car. If the second or third car ahead stops suddenly, you have advance warning."

Smart Ones Slow Down

But there's a difference between tailgating to hold your position and riding someone's bumper to speed him up. "If he has any brains at all," said a cabby, "this will only slow him down. He'll leave more room ahead of him so he can stop gradually."

But if the car ahead is leaving a big gap in front, cab drivers will usually try to get ahead of him—like the time my cab was crawling behind a staid old gentleman in a big Olds. He left just enough room ahead for everyone to cut in, forcing him to brake and drop back constantly. Finally, the cab driver, with a burst of speed, cut around him.

"I hate to cut people off that way," he said, "but a guy like that can get you involved in his accident."

"How about using the horn to get clods out of the way?" I asked.

"Some cab drivers think leaning on the horn clears the way ahead," he answered. "A few beep just before the light turns green, to keep the guy in front awake."

"I figure one short, polite beep is okay when it's needed. Two blasts, or one long one, make people mad. And if you get enough people mad, they'll slow you down and box you in."

He went on: "A buddy of mine was telling me about the time he was in a mean mood and kept leaning on the horn. The guy in front took it for a while. But finally, at a red light, he pulled up his hand brake, got out of his car, leaned on my buddy's door and asked, 'Okay, so what else did you get for your birthday?'"

"What do you do about a driver who edges into your lane and squeezes you?" I asked.

"Here you gotta give him the horn," he answered. "And you gotta squeeze right back, not only to keep him from getting ahead of you, but to give you more room to duck away if he keeps coming. If you give him lots of room right away, you've robbed yourself of a safety margin."

This brings to mind a variation of the same idea. When someone tries to pass on the right, the cabby may squeeze back, pushing the offending car farther and farther over until a parked car brings it to an abrupt stop.

Other tricks of roadmanship cabbies have taught me: Pull away from a light briskly, so you don't get tangled in traffic. If you shift into neutral when stopped for a light (this saves wear on automatic transmissions as well as on the clutch throwout bearing in manual boxes), keep your eye on the light for cross traffic; when it turns yellow, shift into gear so you're ready to go.

All the drivers agreed that the most important thing to learn is the exact width of your car. This lets you scoot into tight spots that other drivers are afraid to take advantage of.

"Sucker Every Minute"

All's fair in driving, as well as in love and war. Wherever a hole appears in traffic, the cabby will duck in. On a jammed parkway, he'll shoot into an acceleration lane for entering traffic and squeeze back farther ahead to make up a few car

(Please turn to page 218)

BOATING

What's New for the '65 Season?

Cockpits loaded with sit-down space, a 60-horse-power stern drive and an aluminum-fiberglass hull are just a few of this year's show-stoppers

By Art Mikesell

THE BEST WAY to get an over-all view of what's going on in boating today is to head for the nearest boat show.

Whether it's New York's Coliseum, Chicago's McCormick Place or the local armory, you'll find everything under one roof, with plenty of knowledgeable people standing by to answer any questions you might have. You can't beat a show for comparison shopping, and even if you're not in the market you're bound to enjoy just wandering around thumping hulls, asking questions and looking at boats.

If this season's early shows are any indication (and they usually are) you can expect the biggest boom in boating since the late fifties.

One of the most obvious trends this year is in the shape of the boats being introduced. While traditional designs and familiar hull shapes are still by far the most popular, you'll see even more of those squarish multi-bowed runabouts in

COMPACT MERCURUISER 60 is entirely transom-mounted, requires no engine bed. Small enough for 14-ft. boats, it's powered by a four-cycle Renault

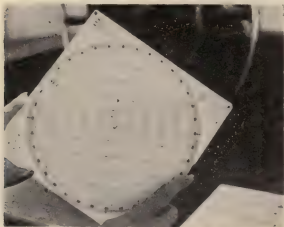




IT FLOATS, it has a waterproof compartment and it's a comfortable cushion—these are three of the best points of the Keep-it-DRI sea bag. It sells for \$3.95 from Connecticut Artcraft, 21 Ann St., Norwalk, Conn.



TIME AND TIDE wait for no man, but the Tidemaster watch tells you both with an adjustable tide scale around the dial. It's \$29.95 plus 10% excise tax from Maker Products, Inc., S. Buckout St., Irvington, N.Y.



evidence. This design approach has been gathering momentum slowly for the past three or four years, but this season it's passed out of the novelty stage and become a solid part of the industry. Chris-Craft and Thunderbird, which pioneered this trend with Dick Cole's cathedral hulls, are just a couple of the many companies offering such designs.

Topside, you'll find that a lot of ingen-



MOST SEXTANTS cost well over \$100. This plastic model reads to two minutes of arc and sells for only \$7.50. Great for practice navigation, it's from Davis Instruments, 8907 San Leandro St., Oakland, Calif.



NEW BOATERS learning the "rules of the road" will find the Carlson Navigation Guide handy for quick cockpit reference. Made by Carlson & Son, 19 James Place, Metuchen, N.J., the Guide sells for \$1

INSTANT INFORMATION on speed, time, distance and fuel problems can be computed easily with the Kenyon Calculator. The price is \$8.50 from Kenyon Marine, Div. of Flexible Tubing Corp., Guilford, Conn.

ious thinking has gone into turning every bit of space into *usable* space. Many of the multi-bows mentioned above are wide open from stem to stern. Others have retained the basic runabout layout, but recessed the foredeck to form a "sun lounge" forward of the cockpit. This recessed-deck idea is even being used in boats of otherwise conventional design, such as Fabu-glas Company's 16½-ft. Portofino.



HIT OF THE BOAT SHOWS this year is a unique line of accessories which snap into sockets installed in the gunnels. Side Kick line includes a ski tow bar, grill, boarding ladder and table, all from Beachcomber Marine Corp., 1821 Yolande, Lincoln, Neb.



COMBINATION fender and fender board can also serve as close-up tow rig or roller for hauling out small craft. Balls are removable for use individually as fenders. The unit is made by Marine Products Mfg., Inc., 221 S.W. 14th Court, Ft. Lauderdale, Fla.



CLEAR ANTIFOULING Unepoxy paint introduced by Pettit provides excellent protection and is non-yellowing, according to the company's chemists. It's aimed at the fiberglass market and offers complete fouling protection without any color clashing



LOW-COST PUMP equipped with a 1/4-in. tube that fits through dipstick hole makes it easy to drain inboard crankcases. The \$7.25 unit made by Peters and Russell can also pump out the bilges



CLEAR PLASTIC strainer stops foreign material from clogging pump. Pumpgard sells for \$3.50, is made by Peters and Russell, 550 W. Liberty St., Springfield, O.

In the cockpit, watch for wild new seating arrangements. Crosby Aero Marine has one of the wildest in its "sombbrero seat," a circular seat with the backrest in the middle. The same company also has an oversized back-to-back seat in its 16-footer which folds down to form a super-width sun lounge. When running, this improves the trim since the big seat is located over the centerline.

Formula's 17-ft. Formula Jr. takes just the opposite approach with a bucket seat for the driver and an upholstered L-shaped bench seat running along the opposite gunnel and around behind the driver. And speaking of buckets, you'll notice that a few boats this year feature molded plastic bucket seats sans upholstery. Trojan's Manhattan comes with two of these seats on swivel mounts, and while

they aren't the saltiest looking helmsman's seats around, that smooth easy-to-clean plastic is pure utility. And comfortable.

Another encouraging trend is quality of design, workmanship and performance found in today's low-priced boats. This isn't really new—there have always been a number of good low-priced boats around—but this year it seems to be more widespread. Glasspar's Goldcup line is a good example, so take a look at them.

The power picture this season? Big news is MerCruiser's new 60-hp. stern drive package which fits into a boat as small as 14 feet and has all sorts of things going for it. Offering those two favorite four-cycle virtues, fuel economy and convenience (no

(Please turn to page 132)



LONE STAR'S SANDWICH construction—aluminum hull, fiberglass inner hull and polyurethane foam bonded between—is offered in both open and express cabin models of the company's 19-ft. Sovereign

New Bottom Finish Speeds the Getaway.

A NEW SILVER-GRAY bottom coating originally developed to lubricate jet engines and missiles has been winning races for powerboat and sailboat owners on the West Coast.

"It adds about five miles per hour to a drag boat that formerly did 75 m.p.h. wide open," Howard Brown of Howard Boats told me. One driver reported a 4 m.p.h. increase, another 7 m.p.h. "Low-speed handling is improved," several agreed.

After hearing more stories like these, I talked to Harry Owen, who was the first to try the coating on a boat. Owen is a field engineer for Electrofilm, Inc., manufacturer of solid film lubricants. These

lubricants consist of minute particles of silver, molybdenum or other materials in a resin that cures to form a slippery, low-drag surface.

About a year ago Owen applied one of these lubricants to his outboard boat's planing surface. He says the slick coat gave him only a couple of miles per hour higher top speed, but that the main improvement was that now he could plane at much lower throttle.

A friend of his who races a stock outboard runabout tried the coating, began winning races and the word spread.

I made arrangements with Glasspar to borrow a 1965 16½-ft. Citation powered

FORWARD EDGE of the speed coating on the planing surface is visible in this photo of Glasspar Citation riding high during speed test runs. Performance was improved considerably, in spite of the rushed application of lubricant





WHEN BUTTONED UP tight, Hydrodyne's new 2100 cruiser seems to have the standard cockpit-cabin layout, but come mealtime the port bulkhead can be swung open to put the galley out into the cockpit. With the walk-through front hatch open this also provides plenty of light and ventilation for the cabin

with a 120-hp. MerCruiser outdrive unit to test the product. In "before" trials the boat made 10.7 m.p.h. at 2000 r.p.m., planed at 21 m.p.h., mushed back in again at 15 m.p.h. and reached a top speed of 40 m.p.h.

Then we sprayed on the speed coat. Instructions were to wait for an hour before burnishing and to let it air-cure for six hours. But since time was limited we burnished the surface within a few minutes and had the boat back in the water within an hour.

At 2000 r.p.m. we averaged 13 m.p.h., a speed increase of more than 20 percent. And now the Citation leveled off on a plane at 12 m.p.h., away below the pre-

vious 21 m.p.h. speed. The boat mushed back in again at 12 m.p.h., maintaining its plane at 3 m.p.h. slower speed than before. With six people aboard, the top speed fell off only 1 m.p.h. from the speed it had made with three on board.

So I'm satisfied that the coating does what its enthusiastic users say it does. It's available under the name "Super-Glide" from SHF Distributing Co., Box 7244, Long Beach, Calif. 90807. The price is \$14.95 plus shipping charges for three aerosol spray cans, enough to cover the planing surface of a 16-ft. boat, or \$12.88 per quart, sufficient to cover 100 square feet with a spray gun.—**Thomas E. Stimson, Jr.**

AFTER MASKING OFF everything but the planing surface, the slippery metallic compound in a resin is applied as an aerosol spray and allowed to dry

AN HOUR LATER the coating is burnished to a bright finish with a soft cloth or a power buffer, after which it should be allowed to air-cure for six hours





MOLDED BUCKET swivel seats both port and starboard are standard equipment on 2200 Sea Skiff Manhattan made by Trojan. She sleeps two forward under that solid teak planked foredeck, sells for \$3695 f.o.b. Lancaster, Pa.



ONE SOLUTION to the problem of seating vs. open cockpit space is the round "Sombrero Seat" in Crosby's 18-ft. Vee Sled. It holds four (possibly even six, if they're good friends or midgets) and leaves more deck area free

oil to mix in), this compact unit requires no more interior boat space than a good-sized outboard with a drain well. It's powered by a 67.6-cu.-in. four-in-line Renault engine (the same one used in the Caravelle) which has been modified by Kiekhaefer to meet marine requirements. It's linked to an all-new stern drive, available only in this package, and the whole thing bolts to the transom—no engine bed.

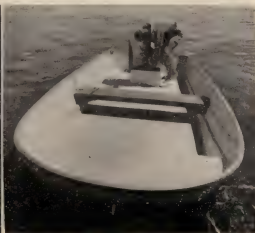
Last, but hardly least, is a new hybrid

aluminum-fiberglass hull from Lone Star. It's an outgrowth of the company's Foam-Pac process in which high-density polyurethane flotation is bonded between inner and outer hulls of fiberglass. The Sovereign hull is made in basically the same way, but the outer hull is aluminum.

It's going to be a bang-up season, so get a head start and take in your local boat show. Who knows? You might end up with a new boat.

★★★

BOTH THE SAME BOAT—the runabout on the left is just the deluxe version of Starcraft's fiberglass trihedral-hulled Explorer at right. Live-bait well built in near the transom makes a good seat for running or trolling



Tips on Choosing the Perfect Prop

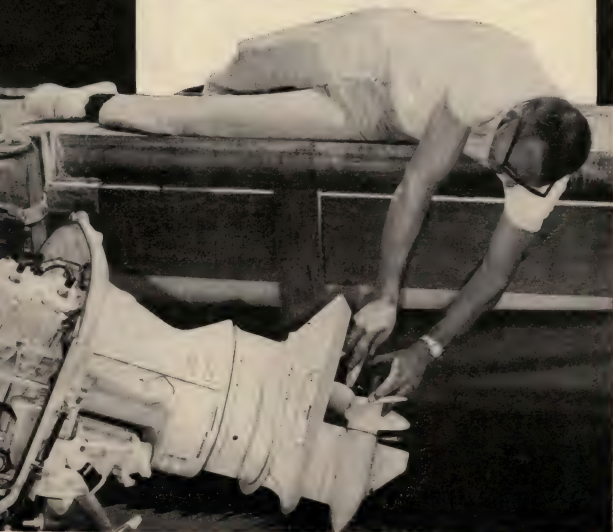
For every rig there's just one prop that will deliver top performance, efficiency and economy. Here's the way you can find that ideal wheel

By Pack Bryan and Marc Michaelson

FOR EVERY BOAT AND MOTOR combination there is one propeller that will produce optimum performance. The finest engine tuning job and the slickest hull in the world will be second rate unless they are combined with the right prop.

Whether you're operating a runabout or a houseboat; looking for speed or economy, ease of handling or pulling

CHANGING PROPS AT DOCKSIDE is a simple matter of removing a pin and taking the prop off the hub. A number of props can be tested in a short time





EQUIPMENT FOR A COMPLETE TEST includes a variety of props, a tachometer, a speedometer and a factory test wheel. The operating specifications for the motor and prop recommendations for boat and motor are also necessary



RUNNING AT FULL THROTTLE on open water, a speedometer is used to compare the speed with the reading of the tachometer, which will tell if a particular prop is allowing the motor to operate within its proper range

power for water skiers, for peak operating efficiency you must do some personal research to find the correct propeller for the particular job.

When the U.S. Coast Guard entered two boats in the punishing 188-mile Miami-Nassau race as part of a small-boat evaluation program, they chose two 30-foot Pearson fiberglass utility hulls powered by paired Cummins 588-cubic-inch turbocharged diesels. Designed for rough water, the boats were to be raced in "semi-stock" condition, leaving on board most of the extra equipment that a rescue craft would ordinarily carry. The only changes from "stock" were in the engines, which were revamped to produce well over 300 hp. per engine.

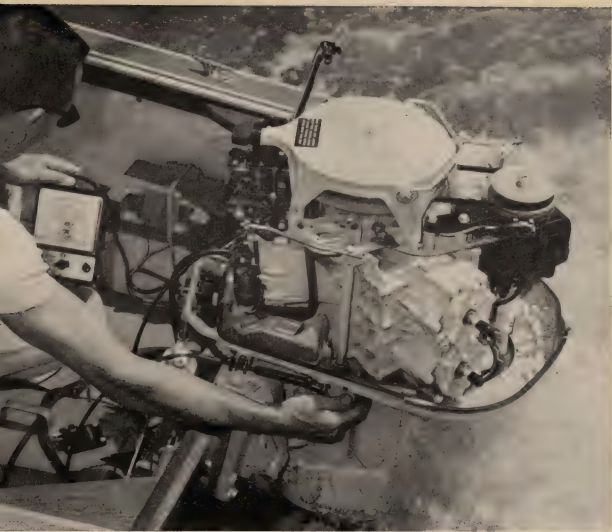
Each boat weighed about two tons and with the addition of a full load of fuel and the problem of rough water, and you

might think that a flat-pitch work propeller would be needed.

But it did not work out that way. The first props they tried were not capable of utilizing all the power the big diesels were putting out, allowing the engines to hit maximum r.p.m. before top speed was reached.

A prop was needed to match the powerplant and the boat's design, giving constant thrust and "bite" even on high speed turns. Finally, the Columbian Bronze Corp. of Freeport, L.I., came up with a deep-pitch prop whose blades were 50 percent wider than usual and contained a special section in each blade to give it added lift. With these special props custom matched to the boat and motors, the Coast Guard took first place in their class.

The same lesson also applies to your own boat and motor. Using simple tests to



DOCKSIDE TEST requires a tachometer and a test wheel, a hubbed wheel into which predetermined water resistance has been built. With the test wheel on the hub, the motor should reach top r.p.m. with the throttle wide open

make sure that your engine is operating at peak efficiency, you can then match it with the best possible propeller.

The equipment you need is available at most dealers and the majority of them will either lend or rent it to you for the few hours it will take to get the job done. You'll need a tachometer and a speedometer, the correct operating specifications for your motor, a list of recommended propellers for your own boat and motor combination, and the factory test wheel for your motor.

A test wheel is literally what its name implies, a hubbed wheel or disc with a calibrated amount of water resistance built into it. Every manufacturer provides such a wheel to match each of the motors he produces. The wheel puts the correct load on the motor when running at peak r.p.m. and will help you to set the standard

against which you'll compare various propellers. It can be used with the motor in a test tank or on the transom at dockside.

Having checked plugs, magneto, timing and carburetion to see that they match manufacturer's recommendations, replace the existing propeller with the test wheel, put the lower unit into the water, and hook up the tachometer. Start the motor and allow it to warm up for a few minutes. Then open the throttle wide and when the tachometer steadies, take a reading. If it goes to the top of the recommended r.p.m. range in the specs, you're all set. If not, make the necessary adjustments to timing and carburetion (you can probably do this when the engine is running) until the needle climbs to the point you're after.

Once you know that the engine will put out the power it's supposed to, you can



COAST GUARD boat won its class in Miami-Nassau race, required special props that had a deep pitch and were 50 percent wider than usual to utilize the output of two powerful diesel engines

begin your search for a perfect prop. However, there's a key step you'll want to take care of first. Check the bottom of the boat.

If the boat has been in the water for any length of time, it will probably have accumulated a slippery growth that's slicker than glare ice. You would think this might increase the boat's top speed, but it can actually cut your speed many miles an hour and should be thoroughly removed. We've found that a plastic scouring pad will cut it better than anything without harming the finish. While you're at it, fill any nicks or gouges and, if there's time, wax the bottom with a good grade of auto wax.

With your present propeller on the shaft, rig the boat as it will run during normal activities. Your first test will be to run straight, without "optional load (O.L.)." Under O.L. include anything not considered standard equipment always carried

in the boat. This could be extra fuel, passengers, camping equipment or anything else not used in day-to-day running.

Your standard equipment might be two full fuel tanks, water skis, anchor and rope, safety cushions and life jackets, fire extinguisher, first aid kit and boat hook or paddle. The idea is to test the boat under conditions as close to normal as possible, rather than setting it up for absolute maximum speed in a superlight condition and then finding it unable to get on plane when you take the family out for a spin. For the first, or base, test, you'll be in the boat alone with all the standard equipment. Move equipment around until the boat floats on an even keel.

Head for open water where you can safely run at full throttle. Once on plane, when you can hear that the engine r.p.m. has leveled off at a peak, check both speedometer and tachometer and record

(Please turn to page 210)

PROPELLER SELECTION TEST *

	Prop	R.p.m.	Speed	Notch	Load	Comments
1st	10 x 11	4000	32	2d	600	First test, recommended wheel
	10 x 11	4300	33	3d	600	First test, recommended wheel
	10 x 11	4400	33½	4th	600	Bow wild, required over steering
2nd	10¼ x 10	4500	32½	3d	600	Notable improvement
	10¼ x 10	4500	34	3d	200	Notable improvement
3rd	10 x 9¼	4800	33	3d	200	Fast getaway, best all around prop
	10 x 9¼	4600	33	3d	600	Fast getaway, best all around prop
4th	9½ x 10	4900	33½-34	3d	200	Original wheel, kept as spare
	9½ x 10	4900	33½	3d	400	Original wheel, kept as spare

* Cruisers, Inc. #100 14-Foot Lapstrake Runabout with 60 hp. Johnson

New Fuel for Modern Outboards

Some day soon you may start saving 60 percent on fuel costs, have smaller maintenance bills and leave no oil slick on the water behind you

By Pack Bryan

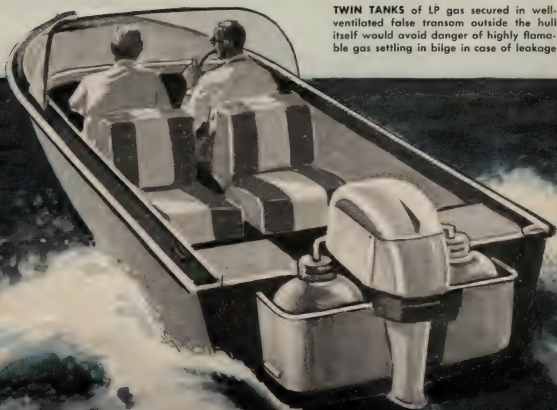
I HAVE NO DOUBTS WHATSOEVER," says Dick Mielke. "The four-cycle outboard converted to run on LP gas will eventually take over from the standard gas and oil burning outboards. There are still drawbacks to be ironed out for the runabouts, but for bigger boats LP just can't be beat."

Owner of the largest fleet of rental houseboats in Wisconsin, Mielke converted a new 55-hp. Homelite four-cycle outboard to bottled gas last summer and came up with a 60-percent drop in fuel costs.

The switch to bottled gas came as a result of a long series of recurring motor troubles during the 1963 season, troubles which caused him to spend over \$2000 in replacement spark plugs alone. He eventually traced these troubles to a combination of customer carelessness and the specialized nature of his rental business.

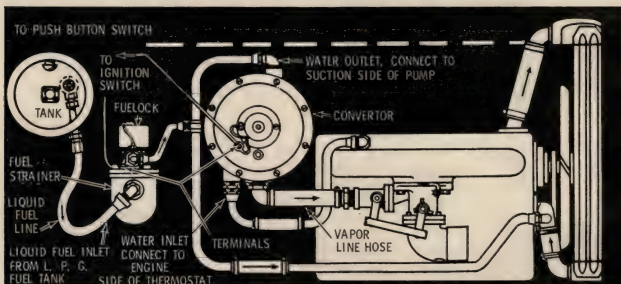
Unlike most rented boats and motors, which are fueled at their home base and returned the same day, Mielke's houseboats go out for as much as a week at a time and range as

TWIN TANKS of LP gas secured in well-ventilated false transom outside the hull itself would avoid danger of highly flammable gas settling in bilge in case of leakage





TWIN HOMELITE FOUR-CYCLE OUTBOARDS were fitted to this rental houseboat and run off propane vapor to test the fuel's efficiency. The motors not only ran without mishap, but operated at 60 percent less cost than gasoline



TYPICAL LP GAS INSTALLATION in an automobile is illustrated in the drawing (above). The outboard installation is similar, with the exception that a water intake and exhaust replaces radiator and provides water circulation

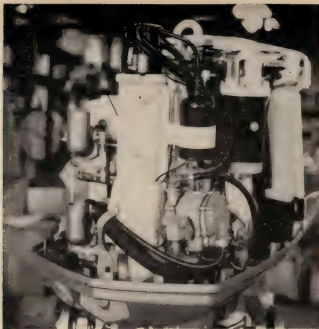
far as 200 miles away from home port.

Two-cycle outboards can be temperamental when they're fed the wrong gas and oil formula, and not every person who rents one is familiar with the fuel requirements. A careless or ignorant dock attendant who does not take the time to mix the fuel properly can cause considerable trouble. An engine that is run first on raw gas from the top is not being lubricated and the cylinder walls can easily be scored. And when it is suddenly

slugged with a stiff dose of oil from the bottom of the tank, the engine will smoke and the plugs will invariably become fouled.

After months of covering hundreds of miles to rescue irate customers who were stranded by fouled plugs, Mielke knew he had to make a change.

Reasoning that a four-cycle engine, which doesn't require the mixing of oil with the gas would be less susceptible to the ills described above, he re-equipped



SPECIAL LP GAS carburetor replaces the gasoline carburetor. The liquid LP is converted to a vapor in an expansion chamber before it reaches the motor

which fueled the lamps, stove, refrigerator and heaters on his boats, he also knew that fleets of busses and taxis in dozens of cities were using it, and that countless thousands of farm tractors and industrial power plants of all sorts had also been converted successfully.

LP gas is cheaper than other marine fuels. And although there is currently a lack of LP gas fueling facilities at most marinas, when the demand is created, the bottled gas will follow. LP gas burns clean, with no by-products to blow past the rings and contaminate the oil. Plugs will last up to 25,000 miles, for example, in a car or truck. It's dry, so it won't wash down the cylinder walls and leave them subject to scoring while diluting the oil. It has a high enough octane rating for standard engines so that there's no need to add lead to prevent knocking and then pile other compounds on top to counteract the bad side effects of the lead. It produces much less monoxides and fumes and its exhaust, as a result, is clear.

With a "let's do it and see what happens" approach, Mielke set to work with engineers from Pyrofax (a leading marketer of LP gas) and Marvel-Schebler (the division of Borg-Warner that makes Century LP gas equipment). Contact was also maintained with Homelite. An extra line was run from one of the LP gas bottles already on the boat and connected to a regulator at the engine. An LP gas carburetor replaced the gasoline carburetor on the engine, and the timing was changed.

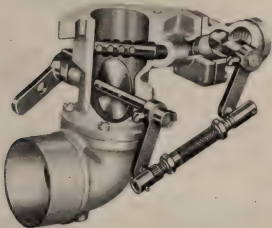
The engine fired on the first crank and was run for a total of 155 hours before they took it off to check it over. (155 hours is roughly twice what statistics say the average outboarder uses his boat each summer.) Operating costs dropped from 75 cents an hour to 26 cents, pushing a 36-foot twin-hulled houseboat with a 12-foot beam.

Spark plugs remained almost unbelievably clean and at the end of the 155 hours, looked good enough to go for another three or four times that number.

In addition, the oil stayed clean and didn't need to be changed once. Having been warned that the oil would remain deceptively clean and fresh looking, Mielke decided to install an engine-hour meter so that regular oil change and maintenance intervals could be scheduled accurately.

By using the existing bottle set-up on

(Please turn to page 214)



LP CARBURETOR is equipped with a rotary valve with contours that establish amount of gas needed for idling. Full throttle is controlled by a spraybar

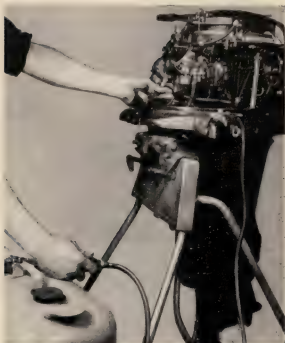
his fleet in early 1964 with new, 55-hp. Homelite outboards, husky four-cycle jobs with a good record of reliability behind them. Immediately his plug problems evaporated and he was able to send his customers out without a quiet prayer that they'd get the right kind of fuel whenever and wherever they stopped. Fuel costs dropped significantly, too, and once on the track of operating economies, he decided to experiment with using LP gas.

Already experienced with the LP gas

What to Do Before Your

Black tracks on the magneto, a hairline crack in the flywheel casing, pitted points or a spitless exhaust—all are clues to potential conkouts

By Henry B. Notrom



TO CHECK FUEL FLOW, hook up the tank-to-engine line and remove the bottom drain plug from the carburetor, then pump gas through the system. Any obstructions or damage can then be pinpointed with ease

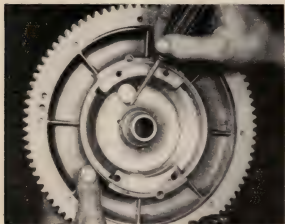
SUPPOSE A TINY CRACK developed in the flywheel casing of your motor at the tail-end of last season. The ignition probably wouldn't give you any trouble on your final run, but that crack is going to get bigger as this season progresses. And one bright boating weekend you're going to find yourself in the middle of a lake, cussing out a dead motor.

Such breakdowns can be avoided by checking your motor over carefully before the season starts, and this involves a lot more than switching spark plugs, pumping in grease and polishing up the cover.

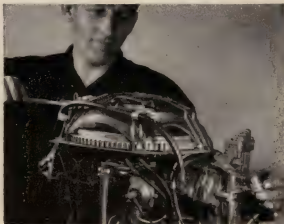
Ask a man whose bread and butter is outboard maintenance. According to Don Boron, owner of D&R Boat Sales in Greenbrook Township, N.J., "Starting in late May and right through the season, we get engines in our repair shop that shouldn't be there in the first place. They started OK in March, but after being run awhile an undetected problem snowballs and the customer gets a bill that could have been avoided."

Taking it from the top, the first necessary service when preparing your outboard for the season is to make sure all

CRACKS IN FLYWHEEL can prevent full ignition spark and impair performance, and will probably become more serious as season progresses. Buy a new flywheel



TO TEST SPARK PLUGS, hold each plug to ground while you spin the recoil starter (or activate the electric starter). If plug's good, you'll get a fat spark



Outboard Conks Out

parts turn free and easy. Always use the recoil starter to check this, even though your motor may be equipped with electric starting. (If full current is shoved through the system and something is binding, things could literally bust wide open.) Engines with electric starters have a pulley on top of the flywheel for this purpose.

Remove the cover, put the engine in neutral and pull the recoil starter. If parts are binding—if the recoil starter doesn't pull out easily and all the way—chances are moisture has rusted metal somewhere inside.

Depending on the extent of the seizure, you might be able to free it yourself. At least you won't hurt anything by giving it one or two tries.

First, remove the starter top. Then, with a breaker bar and a properly fitting socket on the flywheel nut, give one or two quick tugs in the direction of flywheel rotation—but that's all. If the engine doesn't free itself, it has to be dismantled and this means a trip to the repair shop.

Suppose, though, that the engine does break free. This doesn't mean that the same rust won't cause binding again, so lubrication is needed. (This lubrication, by the way, is a step that should be handled in the fall to help prevent internal rusting during storage.)

After removing the spark plugs, squirt a little motor oil into each cylinder. Now, give the engine a few whirls with the re-

coil starter to distribute the oil around the cylinder walls.

As long as you have the plugs removed, make sure they're in good shape, then clean and regap them (or buy a new set). But before replacing them, check the overall condition of the ignition system.

Put a plug boot on one of the plugs, hold the plug to ground and pull the recoil starter. (If your engine has electric starting, you can run this test by cranking it electrically.) A fat, hot spark should jump the plug's electrodes.

If not, you've got an ignition breakdown and the flywheel has to come off to check points, coil clearances and, most important, the condition of the flywheel itself.

Should you pull the flywheel if the ignition check proves satisfactory? That's up to you, but it's one sure way to detect an ignition problem in its early stages and it's the only way to make sure points are properly gapped. To remove the flywheel, though, you have to borrow or buy a flywheel puller, a specialized tool costing anywhere from \$4 to \$25, depending on the size of your motor. These are specialized tools that you can't purchase at a local hardware store. Order one through your local outboard dealer or direct from the manufacturer of your motor.

Check the inside of the flywheel closely for cracks that might prevent full ignition sparking. If you find any cracks, replace the flywheel.

ENGINE DRAG caused by internal rust can often be overcome by first breaking the engine free with a breaker bar and socket placed on the flywheel nut



FLYWHEEL PULLER is one tool you should have if you plan to do much of your own maintenance. You can probably buy one from manufacturer of your motor





If your engine is mechanically started or a direct battery-to-starter type, check magnetos on the flywheel for black tracks caused by misadjusted coil laminations, hitting against them. These coils, by the way, are pre-set by machine, so don't try to reset them yourself. Get replacements from your dealer.

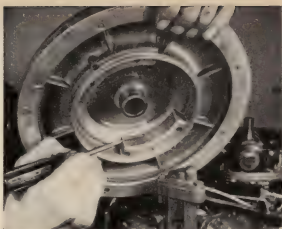
The magnetos must also be shiny and free of rust. If not, it indicates a cracked or bent flywheel, or a bent crankshaft. So, again, check the flywheel carefully. You might not be able to determine whether it's bent. If you can't, try a new flywheel first (it's cheaper than checking for a bent crankshaft). If this doesn't clear up the trouble, then the crankshaft will have to be checked.

If the magnetos are in good condition, coat them lightly with ordinary engine oil.

The other common cause of poor spark is worn or misadjusted breaker points. Examine the points. If worn or pitted, replace them. Then regap to the specification indicated on the flywheel housing.

If a fat spark fails to occur with an electrically operated engine of the direct battery-to-starter type you should, naturally, check the battery and associated parts (solenoid, cables and ignition switch) in addition to the flywheel and magnetos. Any interruption of current flow from the battery will prevent good spark.

In battery-powered engines that have an automotive-type ignition set-up, in addition to the battery and the rest of the charging system (alternator or generator and regulator), one major cause of poor spark is a weak coil. Test with a volt-



TRACKS ON MAGNETOS indicate that the coil laminations have thrown their adjustment. Magnetos in good shape should be shiny and free of any rust

ADJUSTING POINTS is a simple job requiring a screwdriver and the correct size feeler gage. If you find the points are pitted, it's time to replace them

meter and ammeter to pinpoint the malfunctioning area.

When ignition system checks are complete, install the spark plugs and turn your attention to the fuel system. (This is especially important if it wasn't done in the fall, and if all gas wasn't drained at that time.)

An over-all check of the fuel system is made by hooking up the fuel tank to the engine, unscrewing the bottom drain plug of the carburetor and pumping up tank pressure to send gas through the fuel system. This does two things—it gets rid of stale gas that was left in the system and checks the fuel system for obstructions or damage.

If no gas comes flowing from the bottom drain, remove the fuel line entering the carburetor. Gas pouring out indicates trouble inside the carburetor—gas is getting to, but not through, the carb. If no gas comes out at the carb, then there's a restriction back toward the fuel tank in the filter or fuel line. In such cases, change the filter element and clean out the line.

Remember the greasing operation we seemed to berate before—we didn't mean to, because it's important. It's a job that should be handled in the fall, but if you didn't get around to it then, be sure to cover it now. Otherwise you're asking for trouble.

So, remove the bottom plug and overflow plug of the lower unit and let the old fluid drain out. The engine must be in a vertical position to permit full drainage.

Pump in fresh oil (hypoid 90 gear oil) until it flows out the overflow plug. While

Outboard Clinic

down on that lower unit, check the prop for pitting, nicks or other signs of damage. If bent, your dealer might be able to straighten it with a prop block. If he can't, or if the prop is otherwise damaged, replace it. Running a bad prop is the quickest way to lose both performance and fuel dollars. (See "Tips on Choosing the Perfect Prop," p. 133.)

Finally, lube all zerk fittings with marine multipurpose grease, type A.

You're now ready to put the engine in the water to test the cooling system. This can be done in a 55-gallon drum or at the dock before that first weekend of boating. But the engine shouldn't be run for any period of time without checking its cooling condition, no matter how it operated on the final run last fall.

Start it up and keep your eye on the exhaust port on the lower unit. Engines that don't have thermostats should have water spitting out that port immediately. If your engine does have a thermostat, allow a three-minute warmup period for the thermostat to open.

If no water spurts out, chances are the water pump's shot, which means that the lower unit will have to be ripped into and the pump replaced. The exhaust port could be clogged, but this is comparatively rare. With a thermostat-equipped unit, maybe the thermostat has gone bad and is not opening. ★★★

FILTER CAN BE a trouble spot in your fuel system, so clean and inspect it thoroughly. A torn or punctured filter should be replaced immediately



MARCH 1965

Q I'm stumped. After a complete fuel system service, which included cleaning the carburetor and replacing the fuel filter of my Evinrude Sportwin, the engine continues to cough and die. Never happened before. It's getting spark, so I don't believe it's ignition. Any ideas?—J.B., Fla.

A One or two. There might be a kink or break in the fuel line. Or you may be operating the engine at full throttle with too lean a mixture. I'd also check the gas tank cap. As strange as it might sound, if that cap were put on too loose the last time you filled up the tank, it can cause engine coughing and dying. A loose cap results in a pressure drop—pressure that's needed to insure a proper gas feed to the engine.

Q I just bought a new 60-hp. Johnson, and in looking over the engine, I found this caution on the red lead going from the battery to the starter solenoid: "Disconnect Battery First. . . . Then Disconnect Solenoid." Can you tell me why?—B.C.J., Wisc.

A This model has an alternator, with the battery cables running directly from the battery to the engine and not through a junction box, which has been eliminated on many 1965 models. This, then, is a caution which must be observed since that positive cable, which you call the "red lead," is hot whenever the battery is connected. If you unhook the lead at the starter solenoid without first disconnecting it at the battery, any accidental touching of that cable to a ground, or even to the wrench you're using, will result in an electrical arc and possible burning up of the cable insulation or damage to the alternator.

As a service to the readers of *POPULAR MECHANICS* in solving problems relating to their outboard engines, you are invited to submit your questions to this column. All questions will be answered, either in the column or by mail. Address Outboard Clinic, Popular Mechanics Magazine, 575 Lexington Avenue, New York, New York 10022 and enclose a 5 cent stamp.

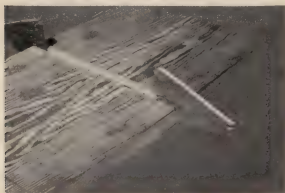


Saucy Shingle

Don't let the \$25 price tag fool you. This sleek one-man skimmer is a rugged boat built for speed

DESIGNER: Glen L. Witt
TYPE OF HULL: Three-Point Hydroplane
LENGTH: 8 ft. 2 in. Over-all
BEAM: 54 in.
WEIGHT: 74 lbs.
COST TO CONSTRUCT: \$25
MAXIMUM HP: 20
SPEED: 33 m.p.h. with 14-hp. McCulloch motor turning 7½ x 10 two-blade prop; load included 175-lb. driver and 5 gal. gas
CONSTRUCTION DRAWINGS: George Blow, PM Art Dept.

RUNNER CHINE is installed on the bottom planking forward of the line marking position of Frame 1



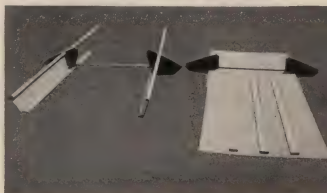
WHILE NOT INTENDED for an assault on world speed records, *Saucy Shingle* is basically the same breed as those big record boats. Three-point hydroplanes hold all major water speed records, and though her points may be smaller, she's a miniature thoroughbred.

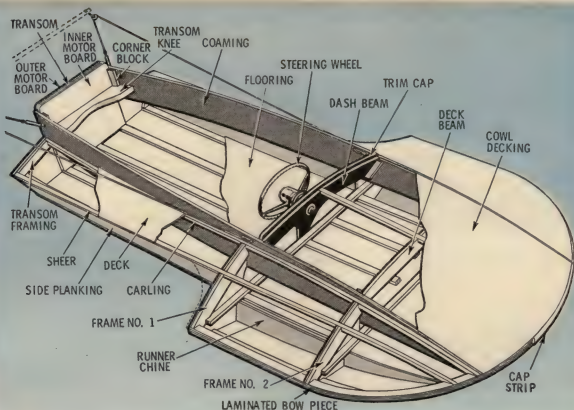
Small enough to fit inside a station wagon or on top of a compact car, the bare hull weighs only 74 lbs. It's an easy construction job that can be accomplished in a corner of your garage or basement.

Study the drawings and photos carefully before starting to build. No building jig is required, but the steps must be carried out in order.

STEP 1. Cut the bottom planking sheet from ¼-in. plywood, and mark the posi-

TWO FRAMES are secured to different sub-assemblies which are then assembled to form the hull framing





tions of the two frames, the transom and the battens. The runner chines are cut from $\frac{1}{2}$ -in. spruce and extend from Frame 1 forward on both of the outer edges of the bottom panel. Nail from the inside of the planking with $\frac{3}{4}$ -in. nails spaced 2 in. apart, after coating the contacting surfaces liberally with glue.

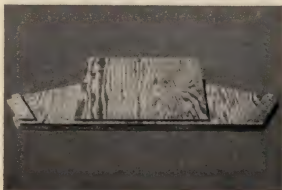
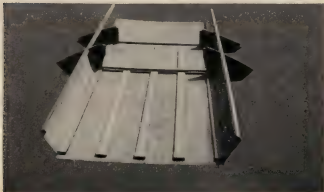
STEP 2. The frames are cut from $\frac{1}{2}$ -in. spruce assembled over $\frac{1}{4}$ -in. plywood gussets. On Frame 1, notches for the non-trip chine and the bow piece are cut into the frame only; on the balance of the longitudinals and also on Frame 2, the notches are cut into both the framework and the plywood gussets. Coat contacting surfaces with glue and assemble the framework to the $\frac{1}{4}$ -in. plywood with $\frac{3}{4}$ -in. nails. After the two half assemblies

WHEN ASSEMBLED, note that the bevelled chine member extends forward to where it meets Frame 2

PATTERN KIT AVAILABLE

For those who desire to work from full-size patterns a kit is being offered. In addition to patterns for the runner chines, bow piece, side planking, and coaming this kit includes half-section templates of the transom, frames, deck and dash beam. A complete instruction sheet with written text, construction photographs and a separate drawing of construction details is also furnished. The price of the pattern kit is \$8.50 postpaid, and it may be obtained from Glen L. Marine Designs, 9152 E. Rosecrans, Bellflower, Calif.

BOTTOM EDGE of the transom must be bevelled 15 deg. to mate with bottom planking when it's installed





BLOCKING ON AFT side of Frame 1 should be secured to side planking before it's attached to frame

BOW PIECE made in two halves fits in notches in frames and rests on the bottom planking assembly



WHEN ALL FRAMING has been installed, it must be faired to assure perfect mating with the planking



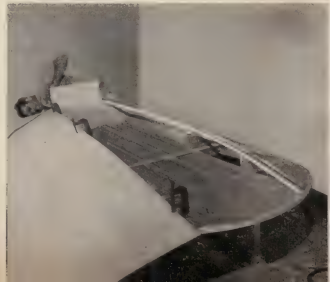
are made, they are mounted over the $\frac{3}{4} \times 1\frac{1}{4}$ -in. crossmember so that the inside distance that will contact the runner chines is accurately spaced at 16 in. on either side of the center line.

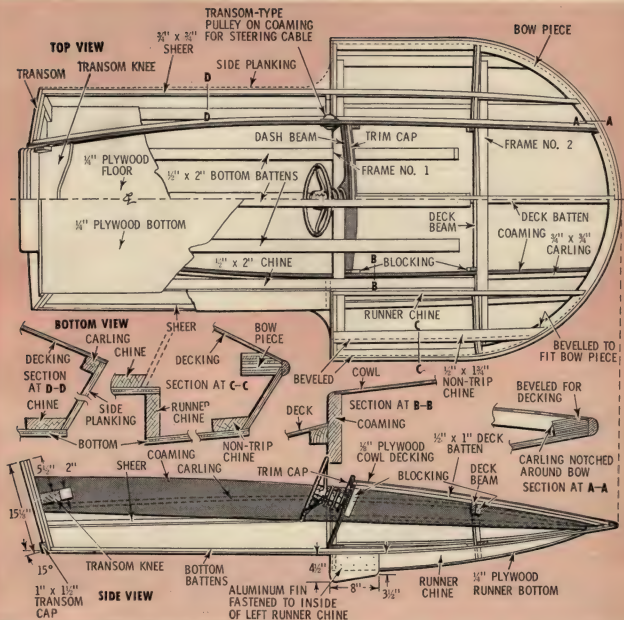
STEP 3. Tack Frame 2 in place on the bottom planking, then permanently fasten it by driving nails through the underside into the cross member and through the runner chines into the side frame member. The three $\frac{1}{2} \times 2$ -in. bottom battens are nailed from the underneath side with $\frac{3}{4}$ -in. nails spaced about 3 in. apart. Note that at the aft end these members are bevelled to accommodate the 15-deg. angle of the transom and aligned to the inside of the transom surface.

STEP 4. The side planking is cut from $\frac{1}{4}$ -in. plywood and assembled to the chine and sheer clamp. Align the aft portion of the chine and sheer clamp carefully to allow for the thickness of the transom. The forward ends are allowed to run wild for cutting to length after assembly. Observe that the bottom edge of the plywood side planking and the chine are bevelled at a 30-deg. angle. During assembly, be sure that the bottom planking is straight as it contacts the chine member. Coat mating surfaces liberally with glue and nail with $\frac{3}{4}$ -in. nails spaced about 2 in. apart. Frame 1 is then assembled and slipped into position over the chine members. Notice that a notch will be made in the chine to enable the frame to be slipped into position over the chine. On the aft side of the Frame 1 gusset, a block is used to fasten the side planking to the frame.

STEP 5. The sub-assembly just completed—side planking, chine and sheer with Frame 1—is now assembled to the bottom planking. The chine should run forward to contact with Frame 2. The sheer clamp is left to run wild over the

BY CAREFUL CUTTING you can obtain all the decking from a single sheet of plywood, so don't rush it

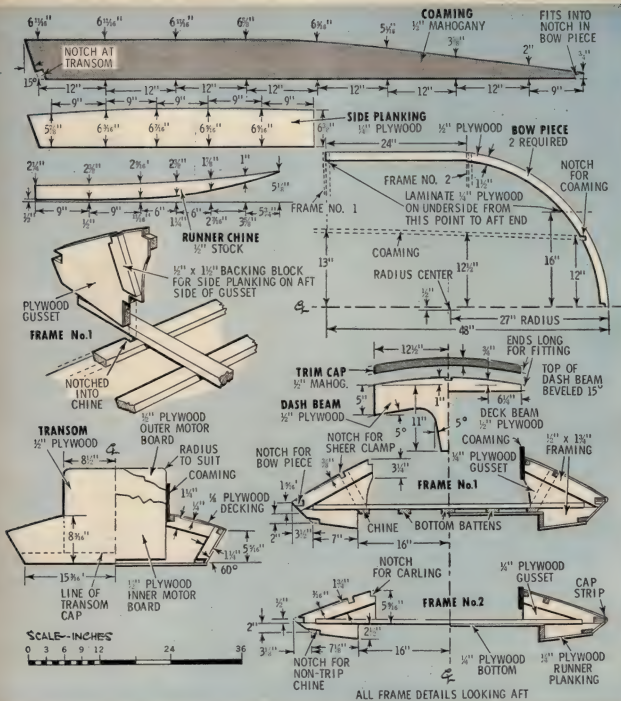




FAIR DECKING edge flush to the vertical carling so that the coaming will mate tightly for a good joint

BLOCKING MOUNTED on the inside of the coaming is used to secure dash beam and forward deck beam





TURNING HULL OVER, the fairing is completed for planking. Note glue blocks at frame-chine junctions

PLANKING for non-trip chine should be bevelled flush with runner so it can be lapped by bottom planking





WHEN RUNNING any motor over 10 hp. on *Saucy Shingle*, play it safe by wearing life jacket and crash helmet

top of Frame 2. Work as rapidly as possible after coating the contact surfaces with glue, and nail through the bottom planking into the chine with $\frac{3}{4}$ -in. nails spaced about 2 in. apart. Where Frame 1 contacts the battens, drive a $1\frac{1}{4}$ -in. nail into each.

STEP 6. The transom is cut from $\frac{1}{2}$ -in. plywood with the lower edge bevelled to contact the bottom planking. The inner motorboard is raised $\frac{1}{2}$ in. above the bottom to act as a bearing surface for the bottom battens. The cap on the aft side of the transom must also be bevelled 15 deg. to accommodate the bottom planking. Assemble the side frame members to the transom, notching for the sheer clamp in the framework only and angling at the bottom for the chine members. Observe that the side frame member is left $\frac{1}{2}$ in. above the bottom to provide a bearing for the chine members. Do not assemble the top frame member to the transom at this time. Cut it oversize on the carling end and set aside. The transom may now be

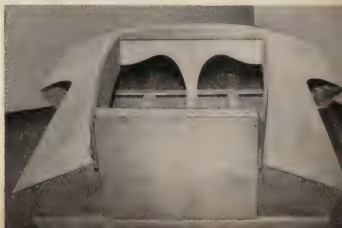
assembled to the bottom planking. Nail through the bottom planking into the $\frac{3}{4}$ -in. member on the aft side with $1\frac{1}{4}$ -in. nails spaced 2 in. apart. The side planking is nailed in position with $\frac{3}{4}$ -in. nails.

STEP 7. The $\frac{1}{2}$ -in. plywood bow piece is made in two halves. As indicated in the drawing, a $\frac{1}{4}$ -in. piece of plywood is laminated to the underside of the aft portion of each of these pieces. The bow piece is then assembled to the bottom planking fitting into the notches in Frames 1 and 2. After coating the contacting surfaces with glue, nail from the planking into the bow piece with $\frac{3}{4}$ -in. nails spaced about 2 in. apart. The excess bottom planking around the bow member is then trimmed off. **NOTE:** From this point until the boat is finished, the hull should be set on a level surface so that the transom is not twisted in relation to the runners.

STEP 8. The sheer clamp is notched into Frame 2 and extended forward to the
(Please turn to page 206)

PAINT INTERIOR of the boat before mounting forward decking, using good rot-preventative coating

CAR STRIP on dash covers exposed edge of forward decking and projects about $\frac{3}{4}$ in. above the surface





EASY TO CARRY, the depth-finder case doesn't take up much more room than any good-sized tackle box

Take-Along Depth Finder Totes in a Box

Strictly for fishermen, this clamp-on unit fits any boat and packs in a compact carrying case

JOHN ORNEY, the man who designed this project, has a job that any fisherman would envy. He's in charge of research and development for the Fred Arbogast Co., one of the world's largest lure manufacturers, which means that he has to travel all over the country test-fishing experimental lures.

Often fishing a different lake every day, John seldom has time to locate the best fishing spots by trial and error. It was this problem that started him thinking about depth finders.

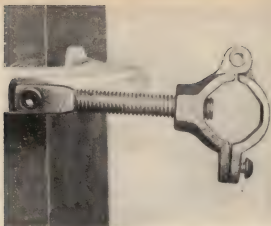
A depth finder can be quite a versatile accessory when fishing unfamiliar waters. It not only tells how deep the water is, but gives you an idea of whether the bottom is rocky or muddy. It will also spot any fish swimming around between your boat and the bottom below. Using a depth finder, you can locate holes, sand bars,

CONNECTING WIRE from the transducer is fed up through supporting bracket and plugged into unit



EVERYTHING STOWS inside the box, even the paper pad for making notations when charting the lake



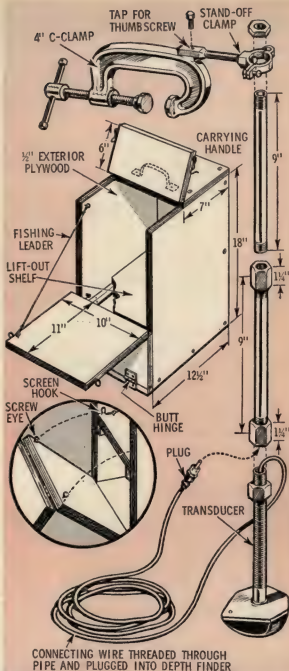


BY LOOSENING CLAMP and sliding pipe up or down, it's possible to align transducer with the hull bottom to achieve an accurate reading. To dismantle the unit, wire is unplugged and tap nut removed so that pipe can be slid out of clamp and taken apart

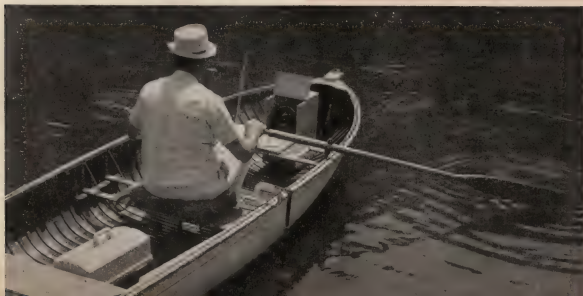
submerged weed beds, drop-offs and other promising bottom features which give a clue to where the fish might be hiding or feeding.

The trouble with most depth finders, however, is that they are designed for permanent installation on reasonably large boats, and John needed something that could be used on any small rental fishing boat. So he made this conversion.

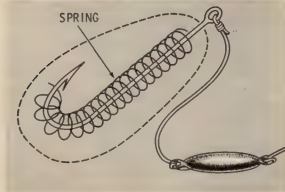
He chose Columbian's "Aqua Probe" because of its compactness and ability to operate off two small 6-v. lantern batteries. Using three short sections of brass pipe, a stand-off clamp and a C-clamp, he assembled a bracket for suspending the transducer from the gunnel. Disassembled, this fits neatly in the bottom of the box in which the depth finder is mounted. The cost of making the conversion was about \$20. Cost of the original Aqua Probe unit is about \$99.—*Frank Kuchirchuk*



UNDERWATER EYE of transducer sends a continuous bottom reading to the depth finder sitting in bow



BOATING AND FISHING



Spring Holds Bait

For carp and other rough fish, dough is often an effective bait. It's difficult though to keep the dough from washing off the hook, and frequent re-baiting is necessary. This annoyance may be overcome to a large extent by slipping the coil spring from a discarded ball-point pen over the hook as shown. The dough, pressed into the open coils of the spring, will be anchored in place and is less likely to be washed away. Once in place on the hook, the spring will stay put since it can't slip past the projecting barb.

—G. E. Hendrickson

How to Read Weather

Whether you're an old salt or just a weekend sailor, a barometer is an indispensable part of your boating gear. The principle is simple: Changes in pressure indicate changes occurring in the atmosphere. This information may be used to forecast weather or to supplement weather reports given in newspapers, radio bulletins, and by the U.S. Weather Bureau.

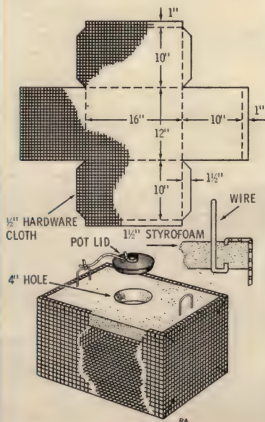
Barometers are made in either of two types—mercury and aneroid. The mercury barometer offers greater accuracy but carries a high price tag. The less costly aneroid type is best for amateur use. With either barometer it's essential to read the manufacturer's instruction sheet before installation to find out what adjustments or corrections may be needed.

Here's how to understand what your barometer is telling you: A falling needle means that a storm is on its way. A fast rising needle indicates clear, windy weather. Variable or rainy weather is indicated by a steady but slowly falling barometer. A steady but slowly rising barometer signifies that the weather has settled. If the wind is shifting to the westward and the barometer is rising, you can expect fair weather. East wind and falling barometer spell bad weather.



Floating Creel

Fresh-caught fish for dinner can be a real treat—if they are stored properly after you reel them in. The floating box shown here keeps your catch alive and in perfect condition. The box is bent from hardware cloth and fitted with a Styrofoam cover to keep it afloat. A pot lid attached with a cord caps the opening cut in the top of the box.—Hi Sibley



PIPE RACK

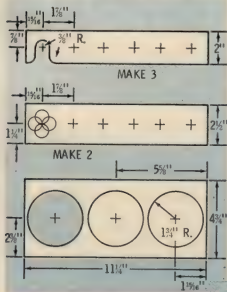
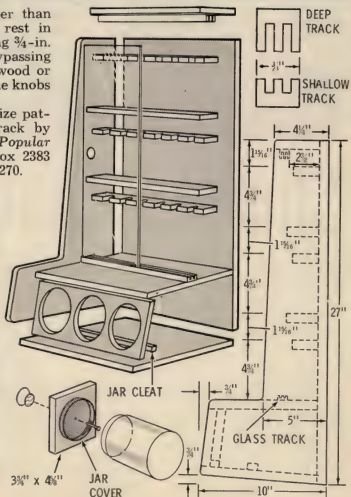
By Steve Ellington

KEEPING a collection of pipes around the house can be a headache—a headache for the housewife who has to dust them, and a headache for the pipe smoker who finds his favorite bowl tinged with the smell of furniture polish.

The answer is to keep them undercover and dust-free in this glassed-in wall rack. It'll hold as many as 18 pipes and can be made wider if you have even a larger collection. In addition to keeping pipes clean and regimented, the rack features two airtight humidor drawers (6-oz. instant coffee jars) for tobacco, plus a third drawer for storing pipe cleaners, reamers and filters.

The kind of wood you want to use it up to you; the rack you see here was made of knotty pine. All the parts are cut from $\frac{3}{4}$ -in. stock and you need nothing wider than 1×12 lumber. The pipe bowls rest in recesses formed by four overlapping $\frac{3}{4}$ -in. holes, bored $\frac{1}{4}$ in. deep. The bypassing (6×19 -in.) glass doors slide in wood or standard aluminum door tracks. The knobs are cemented to the glass.

If you like to work from a fullsize pattern, you can get one for this rack by sending \$1.00 to Steve Ellington, *Popular Mechanics* Pattern Dept., P. O. Box 2383 Van Nuys, Calif. Ask for pattern 270.





Shelves That G-R-O-W

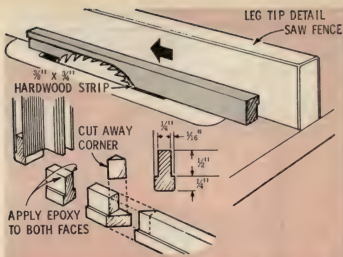
MOST PEOPLE can't keep up with their collection of books. By the time they build a new bookcase, their library has already outgrown it. Paperbacks, especially, proliferate like rabbits. But if you build from the plans on the next page, you've licked the problem. When one two-shelf unit fills up, you just stack another identical unit on top. You might say the sky's the limit, since you can stack all the way to the ceiling—though if you go up too high, it's best to tie the top unit to the wall.

The design is ingenious in several respects: A single unit looks fine by itself, and the protruding end panels serve as built-in bookends for the top shelf. The

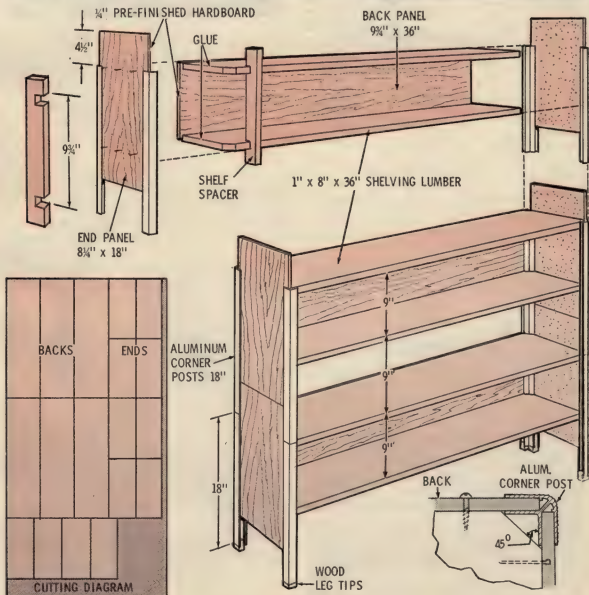
legs of the next unit slip over these panels to set the new unit's ends flush with the old—so that no matter how many units you stack, you'll have solid, gapless panels running down each end.

Best thing about the design is the ease of construction. You cut 1x8 shelving into 3-foot lengths and bevel each corner to take $\frac{1}{4}$ -in. posts. Backs and ends are pre-finished hardboard, glued into the posts' grooves with epoxy cement. Paint all rear faces of end panels to match the shelves before assembly, leaving a narrow strip along the edges for gluing into the posts. You'll also want to roughen the finished edge of the hardboard for gluing.

—Dave Swartwout



FEET FOR BOTTOM UNIT come from T-shaped hardwood strip, cut on bench saw. Fasten shelves along edges of back panels with epoxy and screws; notched spacer (below) keeps them parallel

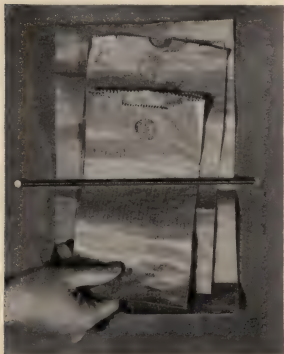




Solving Home Problems

CLOSET HANGER SPACE can be doubled for storing a child's clothes by stretching out two wire coat-hangers and placing a length of dowel in the loops as shown. Staple hangers to underside of dowel. A low rod like this also helps promote the habit of neatness when hangers are within reach of a child

PAPER-BAG HOLDER can be quickly installed on the inside of any convenient kitchen cabinet door. Merely attach a common screen-door spring with two $\frac{1}{2}$ -in. screws, spaced to hold it under light tension

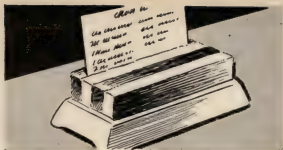


FLOUR SIFTING will be neater if you first slip a plastic funnel of proper size up into the bottom of the sifter. You can then sift the flour directly into a measuring cup or other small-size container





PLASTIC ADHESIVE VENEER will preserve any ready-reference pocket clipping. Attach clipping to sticky side of the veneer, trim off excess. Clipping may then be folded for carrying, will resist wear and wrinkling

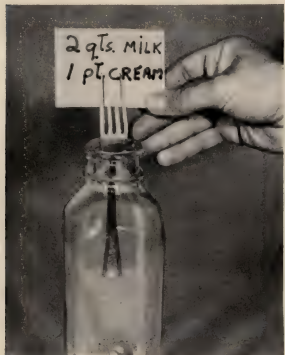


RECIPE-CARD HOLDER can be improvised with a blackboard eraser as shown. The felt plies in the eraser will grip card securely as handy reference. One eraser will hold several cards in this manner

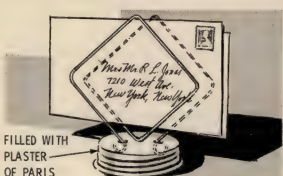
GLAZIER POINTS are easy to set in upright sash when pushed into small dabs of putty placed at the desired locations. Putty holds points squarely in driving position, lessens chance of nipping finger



MILKMAN'S NOTE will not blow away or fall into the bottle if inserted between the tines of an ordinary kitchen fork as shown. Use a paper stiff enough to keep fork from slipping when suspended



DESK-TOP LETTER RACK is made of coat-hanger wire and a jar cap. Bend wire around 2 3/4-in. sq. block, letting ends extend. Insert through holes punched in cover, open ends, then fill cover with plaster of paris



FILLED WITH
PLASTER
OF PARIS

GANG JUG HOLDER means fewer trips to water supply for campers. To make it, thread plastic clothesline through 1/2-in. conduit, attach S-hook and add dowel handle, then insert conduit through jug handles



Caulking That Lasts The Life of Your House

A space-age bonus for the homeowner: Sealants developed for rockets and jet liners let you tighten your home against weather—permanently. Here are the facts on synthetic rubber caulk

By Chris Edwards

HOW'D YOU LIKE to do your Spring caulking this year and then throw away your gun—confident that you'd never have to do that tedious job again? There are new sealants on the market that could make that dream come true.

These synthetic rubber compounds let you seal water out of almost every joint around your home—inside as well as out. And they're a boon to boat owners, too. Just look at some of the things you can accomplish with these space-age sealants:

- A permanent white or colored sealant joint between bathtub or shower stall and

ceramic tile or plastic-surfaced wall panels.

- Bedding a kitchen sink or washbowl to eliminate the metal rim that often interferes with the draining of water from the counter into the sink bowl.

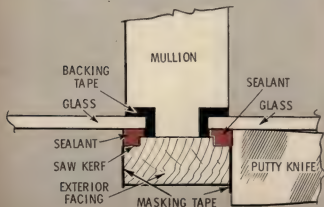
- Wood gutter sections butt-joined with a permanent seal that moves with the joint as gutters expand or contract. Or an equally permanent seal of slip joints between metal gutters.

- Fixed window panes, door glazing and window frames, sealed once and forgotten. Butt joints between panels or strips of wood siding, batten joints without flash-

WHERE BATTEN (exterior facing strip) can be removed, saw off edge of old putty to expose bare wood and to widen groove. On new work, bed glass in backing tape; if fresh putty were used instead, oil might affect adhesion of sealant to glass and batten

SQUEEZE SEALANT into widened groove between batten and window. Here, masking tape has been applied to side of batten (as in sketch, left) to simplify clean up and leave neater edge. None is needed on glass because cured sealant scrapes off easily

WOOD MULLION JOINT



ing, and joints between siding and door or window frames sealed against the water that often causes paint peeling.

- Joints between dissimilar materials, such as wood structure and fireplace walls, or between concrete walks and a house, sealed to prevent water from seeping through the openings. (Joints between dissimilar materials are particularly likely to move with the seasons, cracking out hardened oil-base putty or cheap caulking.)

- Boat seams and joints of all kinds made watertight. (Rubber sealants move with the joints to keep seams leakproof.)

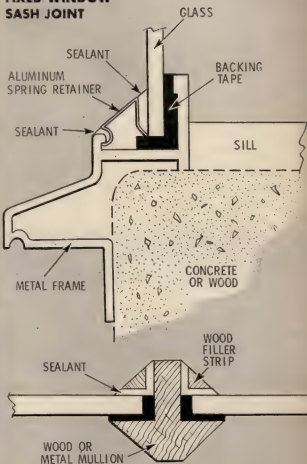
- Concrete, brick and stone joints sealed without fear that alkali from cement will destroy the bond as it does between oil-base caulking and concrete or mortar. Cracks in swimming pools, or in the concrete deck around pools, sealed with matching color sealants.

- Cracks in foundation walls, or between concrete block, sealed to keep water out of the basement.

With time as scarce as it is or labor such an expensive part of any repair job, it makes sense to use a material that will do a better job and last through several repainting jobs. Rubber sealants work better for several reasons:

- No shrinkage or cracking—synthetic polysulfide rubber caulking cures chemically. Oil-base caulking or putty “skins over” when its solvents evaporate; rubber sealants cure by absorbing water or through the chemical action caused by mixing two materials. As a result, there’s no shrinkage. And, since the rubber seal-

FIXED WINDOW SASH JOINT

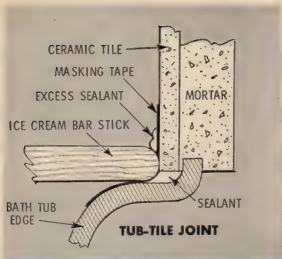


FILLER STRIPS SAVE SEALANT

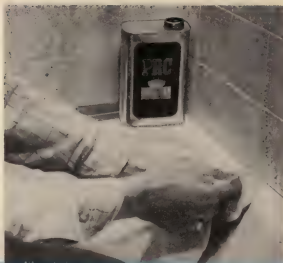
BRUSH SOAP in thick solution over bead of sealant before trimming, to keep excess from sticking to putty knife and glass. Soak thin shavings of a white hand soap overnight in just enough water to soften them into thick paste. Use it on hands, too

PUTTY KNIFE trims excess sealant to leave smooth square joint. Where bevel is needed, trimming is more difficult and can be avoided by seating a triangular wood filler in sealant, as sketched above. Top sketch shows how you seal aluminum spring strip





CROSS-SECTION of tub-to-tile joint shows how sealant extrudes into space for watertight seal. Trimming with stick leaves nearly flush joint



AFTER REMOVING cracked grout between tub and tile, wipe tub clean with solvent-soaked cloth wrapped around putty knife and inserted under edge of tile

ants cure to form a true rubber, the joint remains flexible rather than gradually becoming hard and cracking from joint movement.

● **Permanent performance**—rubber sealants last as long as your house. Polysulfide rubber resists ultra-violet radiation and remains flexible from 65° F below zero to 250° F—hotter than boiling water. Accelerated life tests showed no change in characteristics after more than 50 years of simulated exposure to weather, sun and extreme variations in temperature. Hundreds of gallons of rubber sealants are being used to seal windows into new glass-walled skyscrapers. Until rubber sealants were available, putty in these

buildings was replaced every three to five years to keep windows watertight.

● **Adhesion**—rubber sealants stick to nearly any material. In stress tests, part of the wood or stone will often break off before the bond between the sealant and the surface lets go.

● **Flexibility**—a joint can spread up to three times its original width while maintaining its seal. For example, beads of polysulfide sealant applied around the structural joints inside the wings of the Boeing 707 and Douglas DC-8 jetliners turn these metal cavities into leakproof fuel cells even though wing joints are constantly bending in flight and on landing impact. With rubber sealant in boat seams

DISSIMILAR MATERIALS—here, wood trim and asbestos cement board—present ideal joint for rubber sealants. Apply primer to joint area (note masking tape)



PISTOL-GRIP GUN for plastic tubes simplifies application of bulk sealant. Metal guns can be used as well, but clean-up presents more difficult problem





SIMPLIFY CLEANUP by applying masking tape to both tub and tile. Trim plastic nozzle of disposable tube at angle and squeeze sealant well into gap



AFTER TRIMMING with stick as shown in sketch far left, pull up masking tape. Excess comes up with it to leave smooth, permanent tub-tile joint

—particularly those hard-to-seal joints around the centerboard well or transom—you can keep your boat dry and the joints watertight without waiting for water to soak the planks and swell joints shut.

Older formulations of polysulfide rubber required mixing two parts together before use. Depending on temperature, these mixed sealants have a pot life of two to four hours. A new polysulfide material comes ready for use in bulk or in regular disposable cartons. New one-part sealants cure chemically by absorbing water from the air. Normally, the sealant will skin over in 24 hours and is tough enough to withstand some abuse in 48 hours. But the sealant does not reach a full cure until 60 days after application. You can speed up the cure several ways. One is to keep a moist towel over a seam after it has skinned over. Or you can apply methyl ketone (MEK) or isopropyl alcohol to the surface. Actually, no action to speed up a cure is necessary unless the caulked joint will be subject to severe shear action soon after application.

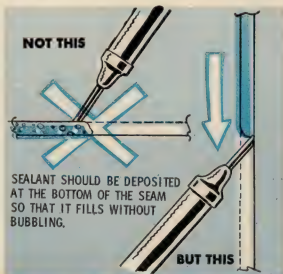
Like many high-performance materials, however, synthetic rubber sealants have a cost disadvantage. They're considerably more expensive than the oil-base caulking or putty they displace. Depending on the kind, quantity and packaged form you buy, they will cost up to three times as much as marine caulking. For this reason, you will probably not use them to replace older materials at every possible location. But you can use rubber sealants economically in two situations: First, where no other material will do the job (for example, many boats can be repaired easily with sealants instead of ripping out hull

LINEAL FEET OF SEAM ONE GALLON OF SEALANT WILL FILL

Depth of Joint	Width of Joint				
	1/4"	3/8"	1/2"	5/8"	3/4"
1/4"	308	205	154	123	102
3/8"	—	136	102	82	68
1/2"	—	—	77	61	51
5/8"	—	—	—	49	41
3/4"	—	—	—	—	34

To compute for 12-oz. cartridge, divide gallon length by 10. Example: Gallon fills 205 feet of joint 1/4 in. deep and 3/8 in. wide. So one 12-oz. cartridge fills 20½ ft. of same joint.

GUN NOZZLE should be small enough to reach into groove, to fill it from bottom up so bubbles aren't trapped. Figure amount you'll need from chart above



SYNTHETIC RUBBER SEALANTS, PRIMERS, AND TOOLS

Material	Mfgs. No.	Application	Solvent	Colors Available
Joint sealant	PRC ¹ 5000 PRC Marine Rubber Caulk PRC Pool & Deck Caulk	caulking gun, bedding with knife	trichloroethylene	white, gray white, gray, red, buff, green, blue
	Pro-Seal ² 929	caulking gun, bedding with knife	toluene or MEK (methyl-ethyl-ketone)	white, gray
	PRC PR-391	pour	trichloroethylene or toluene	black, neutral
	Pro-Seal 901	pour	toluene or MEK	black, gray, tan
	Weatherban One-Part Sealant 101 3M Co. ³	caulking gun	toluene or MEK	white, gray, black
Primer	PRC Primer	brush	toluene or MEK	beige
	Pro-Seal 977	brush	MEK or xylene	beige
	Weatherban Primer 101 3M Co.	brush, cloth	water	clear
Backing tape	PRC 620		none required	white
	Pro-Seal 101B		none required	black
	Weatherban Ribbon Sealer 3M Co.		none required	black

¹ PRC materials
Products Research Company
2919 Empire Avenue
Burbank, California

² Pro-Seal materials
Coast Pro-Seal & Mfg. Co.
2235 Beverly Boulevard
Los Angeles 57, California

³ Minnesota Mining and Mfg. Co.,
Adhesives, Coatings & Sealers Div.,
900 Bush Avenue
St. Paul 6, Minnesota

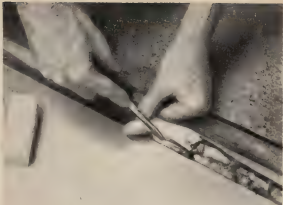
planks or deck boards with rotted edges); second, where the long life of rubber sealants saves frequent replacement of old-style caulking or putty. At locations where maximum performance is required and the cost of replacing less effective materials regularly is high, spending the additional money to use a permanent material actually saves you money and time. As in painting, the biggest cost in reglazing or recaulking is the labor cost for preparing the joints. Time saved in chipping out old, dried caulking before you can repaint your house, for example, more than repays the additional cost of the new, permanent rubber sealants. Boat owners particularly recognize the time and money saved in the yearly maintenance to keep their craft in top condition.

Rubber sealants must be applied to clean wood. Rubber caulking will not stick permanently to old oil-base caulk, paint, or any oily surface. A new application of the sealant may appear to stick to a hard-painted surface, but the bond is between the sealant and the paint. When the paint cracks or chips from the wood, the sealant goes with it. Wood preservatives applied to prevent rot in boats will not interfere with a rubber sealant joint, providing the spirit solvents are allowed to dry out thoroughly before the rubber sealant is applied. On some materials and under some conditions, a primer will improve the sealant joint.

Primers Normally no primer is needed for house caulking because joints are not immersed in water continuously,

FOR CAULKING

Remarks
One-part materials, no mixing. Available in quarts, gallons or 12-oz. cardboard tubes with spout.
One-part material, no mixing. Available in 2½-oz., 6-oz., 12-oz. plastic tubes. Also, pints, quarts, and gallons in bulk.
Two-part material, mix in can and pour directly into horizontal seam. Available in ¼-pt., ¾-qt., 3-qt. cans with space for mixing.
Two-part material, mix in can. Available in ¼-pt., ¾-qt., ¾-gal.
Available in 1/10-Gal. cardboard tubes, ready to use. Tubes fit standard caulking gun and include plastic spout.
One-part material. Use on wood, porous stone, brick, or concrete. A gallon covers 300 sq. ft.
One-part material. Use on wood or masonry where water resistance is important for sealant adhesion. Do not use on metal.
Apply to glass, glazed tile, porous and non-porous masonry. Do not use primer on wood. Do not apply below 40°F.
Sticks on contact. Both 1/16 and ¼ in. thick x ½, ¾, 1, & 1½ in. wide. Tape can be "thumbed" into recesses. Available in rolls 25 ft. long.
Impregnated felt 1/32, 1/16, ⅛, 3/16, & ¼ in. thick, widths from ¼ to 36 in.
Includes own pressure-sensitive adhesive. Comes in 1/32, 1/16, ⅛, 3/16 and ¼-in. thicknesses, widths from ¼ in. to 1 in. in ½-in. increments. Not all combinations in stock.
Hand-operated sealant guns available from: Pyles Industries Inc. A. G. Barstow Company 20855 Telegraph Road 8420 Otis Street Southfield, Michigan Southgate, California (SP-1832, for 2½ or 6 oz. polyethylene cartridges) (Semco 850 series)



HORIZONTAL JOINT, as one between sidewalk and entry threshold, is first stuffed with vinyl or rubber sponge (top) then filled flush with flow-type sealant

SEAL GAP between siding and sidewalk to keep water from running down siding and eroding earth under concrete. Tape keeps sealant off concrete



nor are they under pressure. About the only place you might want a primer is along a sill joint where water stands. Make sure you use a primer made by the manufacturer of the sealant; otherwise, they may not be compatible. Consult the selection chart on pages 162-3. A primer used on wood doesn't make the sealant stick any better or last longer, but it keeps the wood surface next to the sealant from deteriorating. After years of soaking, the layer of wood behind the sealant may let go. The primer penetrates the wood and aids in building a thicker layer of preserved wood for a tight, long-lasting seal.

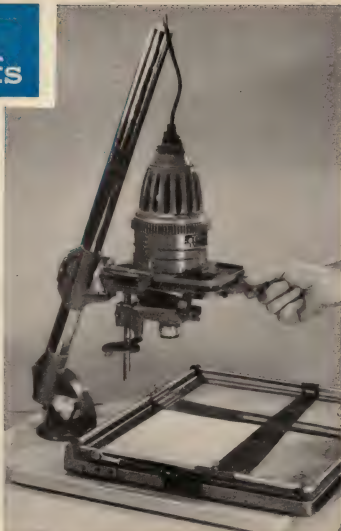
Primers are liquid and can be applied like paint. Use a small brush to control the coverage. If you'll need masking tape

(Please turn to page 199)

New for Camera Buffs

By Arthur J. Maher

FOCUS IN A SECOND, no matter how dense or thin the negative, with one of three new Meopta enlargers. They have small optical devices built into their negative carriers (photo, below) which project two beams of light onto your easel. By turning the focusing knob to align these beams, you focus the image. We tried one of these enlargers, and found it gave excellent results in much less time than other focusing aids we've used. Retail prices are as follows: the Axomat 1a (35-mm), \$87.95; the Opemus 11a (35-mm to 2¼x2¼), \$109.95; the Magnifax II (35-mm to 2¼x3¼), \$179.95. Distributed by Magniphot Corp., 17 E 17 St., N.Y., N.Y.



PRECISE EXPOSURE READINGS are easier with the Metrastar CdS meter. It has a reflex viewfinder that shows exactly which portion of a scene is being read by the meter. Also, its angle of acceptance is only 18 deg., about half that of many CdS meters. \$66. E. Leitz, Inc., 468 Park Ave. South, N.Y., N.Y.



UNUSUALLY COMPACT 35-MM CAMERA, the Minolta P, is almost as small as a half-frame camera, but gives a full 24x36-mm negative. Another useful feature is the 38-mm lens, which focuses as close as 2½ ft. without a close-up attachment. Costs \$59.95. Minolta Corp., 200 Park Avenue South, N.Y., N.Y.



DARKROOM HINTS

Instant Picture Holders

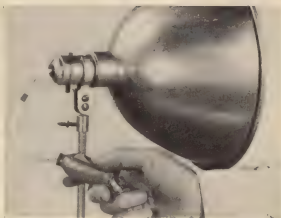
Instead of throwing out the slitted plastic tubes used to pack AG-1 flashbulbs, turn them into desk-top holders for your snapshots. Mount each photo on a piece of cardboard and insert the top and bottom edge into the slits of two plastic tubes. To hold the photo in an upright position, bend a piece of light-gauge aluminum into a Z-shaped "leg" and insert it into the tube on the bottom of the photo.—*Ken Patterson*



No More Burnt Fingers

After a photoflood has been on for a few minutes, touching the socket to push the on-off switch can give you a painful burn. To save your fingers, install a line switch on the photoflood cord as shown at right, placing the switch about a foot from the socket. Naturally, the original switch should be left in the "on" position.

When buying the switch, spend a little extra for a heavy duty type. When used with photofloods, light-duty switches tend to arc and burn out, which, of course, is both wasteful and hazardous.



Dry Hands Mean Better Prints

Wet fingers in the darkroom can stain your prints, dirty your enlarging easel and contaminate your chemicals. So for quite a while now, I've rented a wall-hung towel dispenser from the linen supply house that services local businessmen.

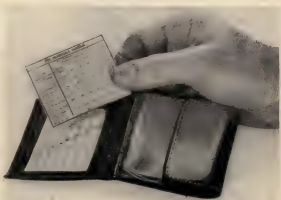
I placed the dispenser on my darkroom wall, right above the wet table. Once a week the linen supplier comes to put in a new roll-type towel. While this service costs a few dollars each month, the convenience and cleanliness are more than worth the expense.—*Wayne Floyd*



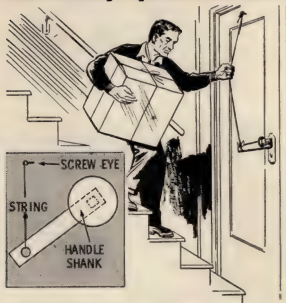
Billfold Saves Lost Shots

How many times have you begun calculating an exposure, only to find you've forgotten a flash guide number or the ASA rating of your film when processed in the developer you plan to use?

An old billfold puts an end to that problem. Stored in your gadget bag, where you can't forget it, it will hold a large number of cards on which you can record the important data on every type of film, flashbulb, developer, etc. you use. Then, if your memory lets you down at the critical moment, just reach for the billfold.



Latch String Opens Attic Door



Ever find yourself trapped on an attic stairs with your arms full and struggling to reach the door knob? The solution, of course, is to leave the door open, but unless you'll only be a minute, you can chill the house this way. To make it easy to turn the knob without standing on his head, one homeowner rigged this simple latch string to open the door. A square hole in a metal bar fits the knob shank to turn it.—H. F. Wendt

A Ripping Good Stunt

To avoid sawing into a sawhorse when ripping a long board, try this stunt: Start the cut for a foot or so, then turn the board end for end and finish ripping. In this way you'll meet the starting cut before you forget about the second sawhorse and saw into it.—G. E. Hendrickson



TO SHARPEN, file at right angles to face till you feel fine burr at each side. Dub off corners, too

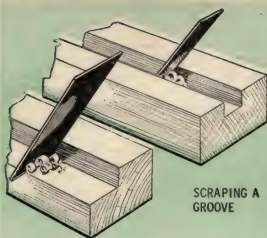
The Forgotten

A FAVORITE finishing tool of old-time cabinetmakers has mysteriously disappeared from the modern toolbox. Yet the square-edge scraper does much finer work than the hook type that's replaced it. Maybe the old square-edge was just too simple a tool to survive in this age of specialized gadgetry. It's nothing more than a $\frac{1}{16}$ -in.-thick rectangle of tool (saw) steel. The handy, inexpensive $2\frac{1}{2} \times 4\frac{1}{2}$ -in. size (still available at most hardware stores) gives you 28 in. of cutting edge, if you sharpen all eight arrises.

What will the scraper do? It will cut with, against, or across the grain of both fir and hardwood, shearing off the most stubborn fibers—even those twists of birdseye and blister maple. It's the only safe means of cleaning up fine veneers. It's fine for smoothing away ridges made

RUB OFF BURRS with down strokes of file held flat against face. Hone upright, then flat, on oilstone





SCRAPING A RABBIT

SCRAPING A
GROOVE



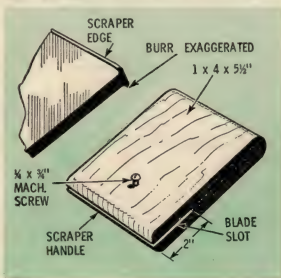
SHARP SCRAPER cuts real shavings. Sliding diagonal stroke gives shearing cut, keeps work flat. Blade above is clamped in kerfed handle, sketched below

Square Edge

by nicked plane blades, and it'll take down any crown left by a power sander.

Probably the main reason this tool has faded from popular use is that it's tricky to sharpen—until you teach yourself how. If you're working all edges, be sure to clamp the blade between wooden liners in the vise. A hard burnisher is the best tool for turning the edges (after filing and honing them straight) but a smooth nail-set can be used. Three strokes per arris should be enough, increasing the pitch for each pass. This turns a smooth burr toward the face of the scraper. Repeat for the other face.

To resharpen, just flatten the burrs with your burnisher, then turn them again as if the edges were newly dressed. You can do this two or three times before you have to file again.—*Edwin M. Love*



DRAW EDGE with several heavy, full-length strokes with burnisher flat against face, using drop of oil

STROKE EDGE with burnisher, starting almost square and increasing pitch to 85° on successive passes





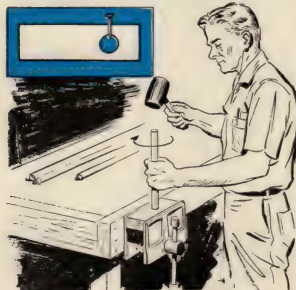
"Stretching" Bar Clamps

Every once in a while a clamping job comes up for which your bar clamps are too short. But if you don't mind sawing them in half, there's a way you can "stretch" them to handle the widest clamping job you'll ever have. It's done by linking the two sections with flat steel plates placed on each side. The ends of the clamp sections are drilled and fitted with a $\frac{1}{4}$ -in. steel pin to engage a series of $\frac{1}{4}$ -in. holes drilled in the steel plates. Thus to adjust the length to suit the clamping job at hand, you simply slip corresponding holes in the plates over the protruding pins in the clamps. Naturally the holes in each pair of plates must align and therefore should be bored through both at the same time. In using bar clamps to glue up a wide panel, remember that they should always be placed on alternate sides of the work to avoid cupping.—C. W. Woodson



Venetian-Blind Tool Rack

Fastened to the wall over your workbench, a section of a discarded metal venetian blind makes a clever tool rack that costs you nothing. Being curved, the metal slats will cradle such rolling items as twist drills, pencils, punches and nailsets, and will provide storage galore for small boxes of tacks, brads, screws and what not. Only a portion of the full blind is used, with every other slat being removed and discarded. Remove the cords but leave the tapes attached to the bottom rail. The remaining slats are flipped over within the tapes so their cupped sides are up. Cut the tapes off a few inches above the top slat and tack the ends to 1-in-thick blocks fastened to the wall.—Frank Shore



Dowel Grooving Jig

You can buy dowel pins in lengths up to 3 in. already grooved but they're not as commonly available as regular dowel rod and they cost more. With this simple jig you can groove your own dowel pins anytime you want. It's nothing more than a 2 x 4 block with a hole in it which is reamed just slightly larger than the dowel size being used. The grooving bit is the point of a nail driven in from the edge until the point enters the hole about $\frac{1}{16}$ in. In use, the block is clamped in the vise and the dowel rod is tapped through the hole while it's being "twisted." The nail point will cut a spiral groove the full length of the dowel. A row of holes to accommodate common dowel sizes can be made in the one block.—Wilfred C. Nise



Adjustable Light Stand Speeds Plant Growth

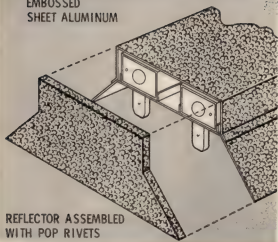
By Walter Burton

LIKE MAGIC WANDS of glowing glass, fluorescent lamps can work wonders on African violets and many other house plants. Fluorescent light sources improve germination and growth of seedlings, hasten the rooting of cuttings, make foliage flourish, and accelerate or hold back the production of flowers.

To support these magic wands of light it is essential that you have a plant stand in which the lamps can be raised and lowered to control light intensity. This is nec-

essary to avoid scorching delicate plants and to be able to lower the lamps to 6 or 8 in. above flats when germinating seeds. The plant stand detailed here consists of a tray-like base from which two uprights extend to support a fluorescent fixture containing two 24-in. 20-watt lamps. These are spaced 4½-in. apart. The fixture can be any two lamp reflector units, or if you prefer, you can construct one as shown, using sheet aluminum and two single lamps, ready-wired "strip" type fluores-

EMBOSSED
SHEET ALUMINUM



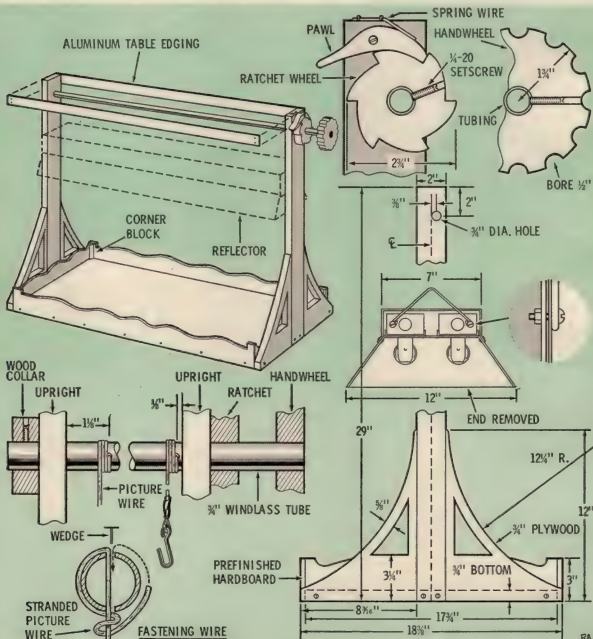
REFLECTOR ASSEMBLED
WITH POP RIVETS

cent fixtures which you place side by side.

An interesting feature of the planter is the wooden pawl and ratchet design used in the windlass, which makes it simple to adjust the height of the lighting unit.

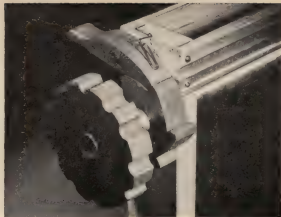
No specific lengths are indicated on the drawings for bottom, edgings, and the windlass tube and braces paralleling it, because these vary with the length of the lighting fixture. In any case, however, there should be about 1-in. clearance between the fixture ends and uprights.

The bottom and the four curved brackets bracing the uprights are made from $\frac{3}{4}$ -in. plywood. Strips of factory finished hardboard, fastened finished-side-out to the bottom with water-resisting adhesive and rustproof screws or nails, form a tray-like receptacle for plant pots and boxes. The





USE A JIGSAW or bandsaw to cut the ratchet from a $\frac{3}{4}$ -in. maple board. The center hole, through which the windlass tube passes, is bored before cutting



KNOB AND RATCHET mechanism makes it easy to control lamp height. The spring that holds the pawl in the ratchet notches is bent from a length of music wire

hardboard strips are scalloped to provide a decorative edging. After the tray has been assembled and the glue used to attach the corner reinforcing blocks has dried thoroughly, apply three coats of waterproof paint or varnish to the inside. This will protect the tray bottom from wetting when a flower pot overflows.

Before gluing the curved brackets to the uprights, bore a hole 2-in. from the top of each upright for the tube from which the lamp will be suspended. These holes are intentionally bored off center so that the suspension wires will be aligned with the upright centerlines. The uprights are fastened to the ends of the base with 2-in. wood screws which pass through holes drilled in the hardboard edging. Make the uprights long enough so that the lamps can be positioned about 12-in. above the tallest plants.

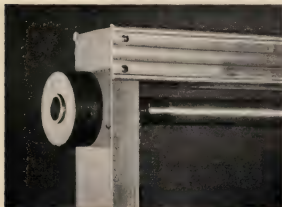
A $\frac{3}{4}$ -in. aluminum tube was used as the windlass drum on the planter shown, but brass, stainless steel or even iron pipe
(Please turn to page 204)

PICTURE-FRAME WIRE is used to suspend the reflector from the windlass tube. A piece of coat hanger wire is formed into a hook to engage the wire arch at the end of the reflector. The wire is looped through the hook eye, twisted and wrapped with plastic tape



A MAPLE COLLAR on the end of the windlass tube prevents endwise shifting. Aluminum table-edging strips installed between the uprights increases rigidity

WHEN LAYING OUT aluminum reflector blank for cutting and drilling, use covers from strip-type fluorescent fixture as templates to assure accuracy

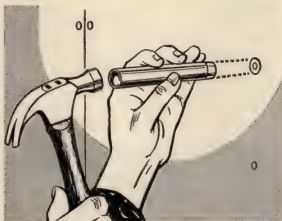




No More Damp Walls

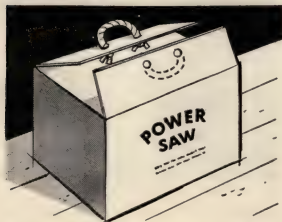
Planning to build a basement rumpus room? If you intend to install wood wall paneling, you can beat the dampness problem with polyethylene sheeting. After installing furring strips with masonry anchors, attach the sheeting, using a stapling gun. The sheeting is obtainable in various widths and is low in cost. It should be applied with as few laps as possible, and any holes cut for pipes or electrical outlets should fit closely. A bead of caulking along the bottom, behind the paneling, will stop moisture at the floor line.

—Victor H. Lamoy



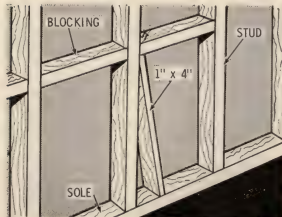
Punch Removes Drywall

When making electrical or plumbing repairs, it may be necessary to remove a panel or two of drywall. This may be done without damage to the panel by using a homemade punch made from a length of electrical conduit. Beveled to form a chisel-like cutting edge, the tube is placed over the nailhead and struck sharply so that it cuts completely through the gypsum board. When replacing the panel, fit it over the projecting plugs and drive new nails into the studs. The punched holes are then filled level with drywall joint compound.—Wilfred Beaver



Free Case for Your Saw

Portable circular saws, sanders and similar tools are often purchased without a carrying case. Usually though, the tool is packed in a sturdy cardboard carton. This can be made into a serviceable case that will protect the tool when not in use and making carrying easier. All you have to do is punch two holes in each side of the lid and insert two short pieces of sash cord to be used as handles. Then knot the ends of each rope on the undersides of the flaps as illustrated.—Morris G. Hulst

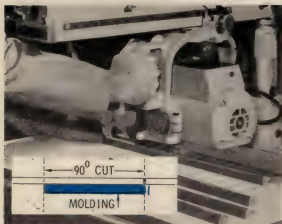


Nail Blocking Like This

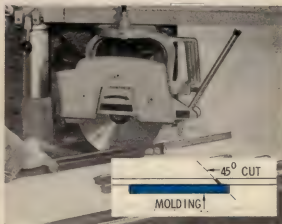
Installing blocking between studs is a tough job because, when you toenail the blocking into the stud, the force of the hammer drives the blocking downward. An effective method for holding the blocking in position while the nails are driven, is to cut a piece of scrap slightly longer than the underside height of the blocking. Place this piece on the sole plate, underneath the blocking as illustrated. After toenailing the blocking, knock out the supporting piece and go on to the next opening. One end of the blocking can be nailed, of course, without toenailing.

—N. M. Pittman

Cutting Picture Frames with a Radial Saw



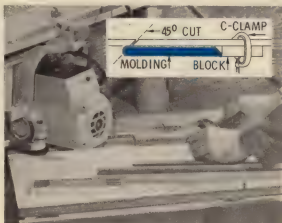
1. **CUT MOLDING** to length and height of picture to be framed—plus twice the overall width of molding



2. **LOCK SAW** for right-angle 45-deg. cut and trim triangular scrap from inside edge of all four pieces

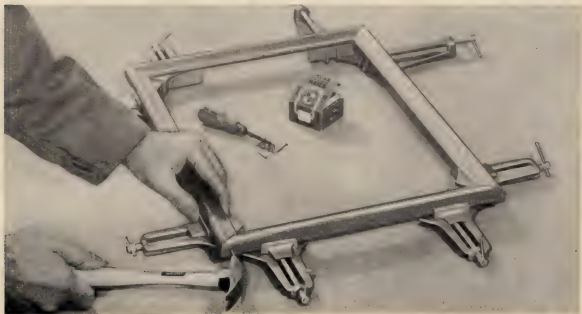
PERFECT MITERS make square frames—that's why most framers fuss with miter boxes. But you can cut tight, square corners on your radial arm saw. And by organizing your work into the steps shown, you can make one frame—or a dozen—with only three settings: straight, right miter and left miter.

Use a fine-tooth blade, and keep the molding's rabbeted edge pressed tight against the fence. Forget the rabbets when you calculate the lengths of the square-cut pairs (two sides; top and bottom). This will leave each piece slightly oversize. But be sure you position the stop block so that the left-hand cut will create an *inside* length $\frac{1}{2}$ in. less than the actual dimension of the picture (if rabbets are $\frac{1}{4}$ in.). After applying glue to miters, adjust joints in clamps by tightening one side at a time.



3. **STOP BLOCK** assures that matching pairs will be identical lengths after left-hand miters are cut

4. **ASSEMBLE CORNER** to exact fit in corner clamp, after gluing, then pin each joint with small nail



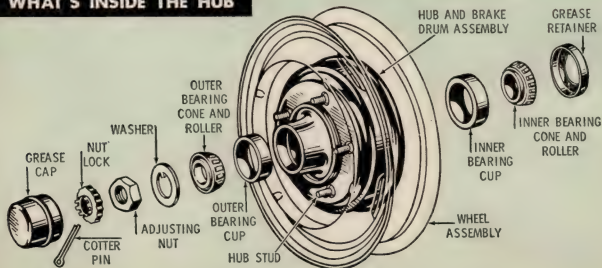
How To Keep Your Wheels From Coming Off

By Morton J. Schultz

It's not as rare a failure as you might think—particularly now that maintenance intervals are being extended. Preventing the problem is pretty much up to you. Here's how

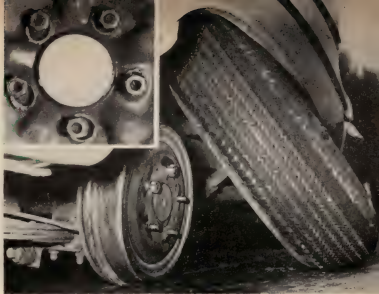
HE EASED DOWN from the 65 m.p.h. thruway speed and swung into the turn-off lane, away from the speeding four-lane traffic. As the decelerating car arced easily around the exit curve, the wind roar subsided and the muscles at the back of his neck began to relax. Suddenly, a grinding, scraping noise came from

WHAT'S INSIDE THE HUB



WHEN THE RIM LEAVES THE DRUM

It's a letdown, whether it's a back wheel, as at left, or a front one. This is one wheel problem common to both ends of the car—and the cause is the same: improper tightening of the stud nuts. The resulting play lets studs chew rim holes larger, until nuts slip through (inset). Off flies the wheel, letting the drum drop to drag on pavement until car comes to rest. Loose wheel may lodge inside fender, as in these photos (courtesy Motor Vehicle Research of New Hampshire), and be damaged by road drag. If this were a front wheel, it would have meant total loss of steering and braking



somewhere up at the front of the car.

"What's that?" asked his wife, tensing upright beside him. His neck muscles tightened again as he peered out into winter dusk. "Dunno," he replied. The noise stopped abruptly, then started again, as he swung the car into the county road toward home. But there was no feel of wobble or thump as he worked the wheel back and forth and gingerly tried the brakes. Finally, the sound (which had become intermittent) stopped completely.

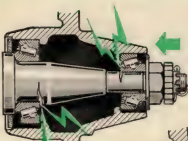
"You'd better get it down to the shop tomorrow," he told his wife, "and have them check out the front wheels. I don't like that sound."

And, dutiful wife that she was, she tried to do just that, next day. But as she eased the car out of their driveway and headed up the street, the left front wheel snapped off. The brakes and steering cut out, of course, and the car drifted softly—and luckily—into a snowbank at the curb. All she could think was: "What if this had happened on the thruway last night!"

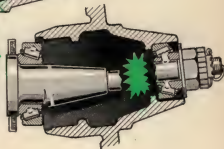
The story is true—and in many ways typical of something that happens more

WHEN A FULL WHEEL LEAVES THE SPINDLE

WHEN ROLLERS FUSE TO INNER OR OUTER RACE, BEARINGS DRAG ON SPINDLE, CUTTING INTO IT

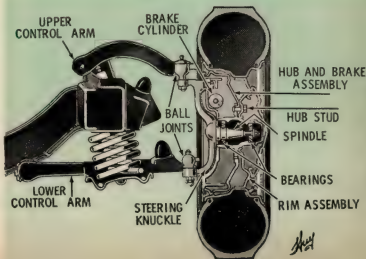


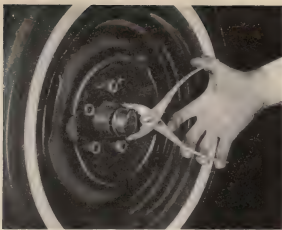
BEARINGS MAY THEN FUSE TO THE WEAKENED SPINDLE AND SNAP IT OFF



FRONT WHEEL ASSEMBLY

The parts "exploded" at the left all pack inside the hub to support the wheel on the spindle. Spindle is rigid extension of steering knuckle, so wheel must ride on a pair of bearings. The cross-section at right shows the completed assembly. Only the nuts on the threaded end of the spindle hold the complete wheel on. If they loosen, or if spindle snaps, you'll lose the wheel. If only hub studs loosen (or pull through rim holes) brake drum stays on spindle. Another danger spot: badly-worn ball joints can pop out of their sockets on bumpy road, letting wheel collapse





FIRST STEP in front-wheel bearing service is to jack up car, pry off hub cap and remove grease cup by tapping it with hammer, pulling it off with pliers



CASTELLATED NUT inside cup is locked on spindle with cotter pin. Once pin is removed and discarded, nut can usually be removed by pulling with fingers

often than you'd think. Why did the wheel come off? Because the bearings burned out, "froze" to the spindle and snapped it off!

At high or even moderate speeds, such wheel failures can become grisly accident statistics. And the tragic irony is that these mishaps are all *avoidable*.

Wheels fall off for a number of reasons. Next to a broken spindle, the main cause is a part of the hub assembly coming loose—especially the locking nut. Wheel lugs, too, are critical parts that can cause wheel failure. And still another area is badly-worn ball joints that pop out of their sockets when the car hits a bump that lifts the front end and slams it down, causing the wheel to collapse.

Of 2.1 million motor vehicles inspected during a recent six-week period in Massachusetts, 40,000 were rejected because of front-end faults such as bearings and ball joints. It seems significant that *since* that inspection there's been a drop-off in

vehicle fatalities in that State.

But, short of being rejected by official inspectors, how can you tell when this danger lurks? As in our opening example, wheels that are about to fail usually give forth an audible warning. With wheel bearings, this warning can come in other ways, as well: Jerky or loose steering, wheel tramp, pulling to one side, side-to-side wander, or irregular tire wear.

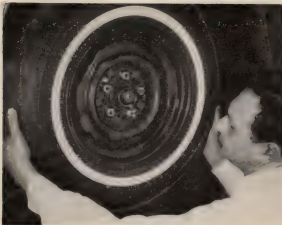
But the main warning sign given by a bad wheel bearing is *noise*, and sometimes the ear is quicker than the eye—or hands—in detecting trouble. This noise could be a squeal, resembling a bad fan belt. Or it could be a clicking or grinding sound.

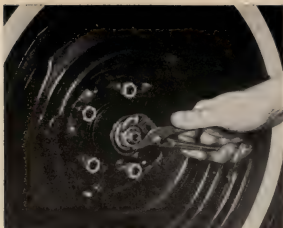
If the noise is a squeal, one way to pinpoint whether it's a bearing is to vary your speed. Apply the brakes and slow down. If the tone of the squeal changes, check the bearings—fast.

How? Your first course of action is to pull over to the side of the road and feel the hubcap of the noisy wheel. Unless

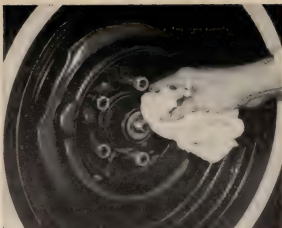
QUICK JERK toward you—about an inch—then pushing wheel back will leave outer bearing loose on spindle. Draw it off and lay it aside on clean paper

REMOVE WHEEL and lay it on clean cloth, outside up. With brass drift set on inner race of inner bearing, gently tap it out. Grease retainer will fall out, too





LOCKING NUT comes off next, plus washer beneath. Nut has either left- or right-hand thread; on some cars, locking nut and adjusting nut are one and same



CLEANLINESS IS BYWORD in handling bearings. Keep clean rag handy and wipe dirt and grease from spindle before pulling wheel forward, to protect bearings

you've been doing a lot of heavy braking, a hubcap that's really hot to the touch is a fair indication of bearing trouble.

Jack up the car and give the wheel a spin by hand. If you hear a click or grind, limp for home or the nearest garage—wherever you can pull the wheel to in-

spect the bearings. *Don't* risk any turn-pike driving.

Just because the noise might stop after a few miles doesn't mean the trouble's past, either. A bearing that isn't turning because it's welded to the spindle won't make a noise.

ONCE BEARINGS ARE REMOVED, wash each thoroughly in special solvent, using soft brush. Never use gasoline or water. Next, repack bearing by working it into glob of grease in palm of hand till grease gets packed between rollers. Throw light coating of grease inside hub, then seat inner bearing with finger pressure





NEW GREASE RETAINER—never replace old one—is laid over inner bearing. It must fit tight to prevent leakage onto brake linings. Best way to seat it is with special tool, center photo—this one sells for about \$6. One whack puts retainer in place, but to make sure it's seated against bearing, tap retainer's edge with drift (right). If you don't have seating tool, you can do whole job by tapping drift around retainer's edge

A worn ball joint gives plenty of warning before it can cause a wheel to collapse. As a matter of fact, the warning usually precedes the chance of collapse by many hundreds of miles. This warning is in the form of road shock transmitted to the steering wheel, a front wheel shimmy at low speed and pulling to one side when brakes are applied.

So far, we've been talking about losing the whole wheel. But, often, only the rim assembly breaks loose from its stud bolts, letting the still-attached hub and brake drum drop to skid along the road, as in the upper-right photo, page 175. But this type of failure still sounds a warning. A clicking or clanging noise that's especially pronounced when you slow down may indicate a lug or two has worked free and is gyrating inside that hub cap. The only way you're going to be sure is to remove

the hub cap and check if they're tight.

A good habit to get into is to check not only the tightness of the lugs, but also the condition of the wheel holes before starting on a trip—especially if the wheels have recently been removed and reinstalled, as in tire-rotation.

But by far the main cause of wheels coming off is bad wheel bearings and trouble in adjacent wheel bearing parts, such as the adjusting and locking nuts. In this respect, then, it may be unfortunate that most new car manufacturers have recently revised their approach to wheel bearing service. Not too long ago, most recommended inspection, cleaning and re-lubrication every 10,000 miles.

Nowadays, many state that servicing of wheel bearings is a "special" job to be done "only when wheels are off for other service." That might not be in 35,000 miles.

KILLER TRUCK, photographed by New Jersey State Police after accident involving death of pedestrian, had defective grease retainer on right-front wheel bearing. This allowed grease to spew over brake linings and drum, as shown in close-up at right. When driver applied brakes, wheel locked and pulled truck out of control



Other manufacturers have increased the interval between servicing from 10,000 to every 25,000 or 30,000 miles.

Of 30 mechanics I spoke to, not one agreed with this decision to make this area of the car "service free."

"Call me old-fashioned," one new-car service chief said, "but I still believe in the 10,000-mile wheel-bearing service. It's not that I'm looking for business (the price of this service is next to nothing), but there have been some stories afloat in the industry that support my theory."

These "stories," appropriately enough, concern incidents of wheels flying off cars. Two years ago, for example, one popular make vehicle had the problem. The cars it happened to had relatively few miles on them—between 10,000 and 15,000. Yet, wheels were coming off on the highway.

The cause of the trouble was traced to the wheel bearing lubricant which had been applied at the factory. (The particular car's recommendation for wheel bearing service, by the way, was every 25,000 miles.) The lubricant broke down under heat. The bearing consequently became so hot it welded itself to its own cup, press-fitted inside the hub. The bearing, in trying to rotate, couldn't; the drag this created on the axle spindle was so great it wore the spindle down until it broke. Or in some cases, the friction-heat welded the bearings momentarily to the shaft, and snapped it off. Either way, good-bye wheel!

If the wheel bearings in these cars had been checked at 10,000 miles, the chances of catching the trouble before it sent a wheel flying would have been much greater.

A truck accident in New Jersey in which a child was killed revealed that a wheel bearing's grease retainer had broken down and grease had leaked onto the brake linings. The driver applied his brakes, but they locked because of the grease and the truck veered into the child at the side of the road.

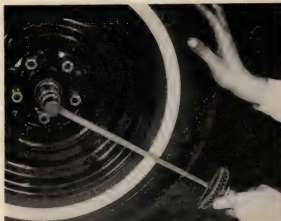
No one could tell, of course, how long it had been since the bearings and associated parts had been checked. But, again, more frequent service, which should always include replacement of the grease retainer (as you'll see later on) would lessen the chance of this sort of tragedy.

The sad irony is that there is no reason to extend the intervals between wheel-bearing servicing. It's certainly not an economy measure. If you had a garage do the job for you once every 10,000 miles, it shouldn't cost you over \$5 for checking, cleaning and repacking both front bearings. Replacement of these bearings, if

(Please turn to page 222)



WITH WHEEL REPLACED on spindle, insert packed outer bearing into its cup in hub. Put back washer and run up adjusting nut. You're now ready for most important reassembly step—adjusting the bearings



SPIN WHEEL as you tighten adjusting nut to car's specification with torque wrench. Then loosen nut and adjust bearings by torquing again. But check your car's specs. On some makes, you tighten to spec, then back nut off specified amount, such as $\frac{1}{8}$ to $\frac{1}{4}$ turn

FINAL STEP is very important one. That cotter pin locks everything in place. Don't try to reuse the old one—top in new one that's long enough to let you wrap legs around lock nut. If pin is omitted or poorly installed, wheel can work loose and come off



AUTO CLINIC

Q The car's a 1962 Oldsmobile Dynamic 88. The problem's a ping that's been there since I bought it. Tune up after tune up has failed to reveal the cause. I use only high test gas. What's the solution?—P.L., New York

A We've come across this one before with the '62 Olds. You'll probably find the cause of the trouble is the vacuum spark advance unit—it's too sensitive and advances too much. You'd best have it replaced. A friend who had the same problem switched to a unit off the 1958 Olds, which is known for its ruggedness. You might try this, to avoid the chance of getting another over-sensitive unit.

Q Twice in the past year I've had to have the valves cleaned, and all rocker arms and several tappets replaced in my 1961 Ford Falcon. Seems sludge just piles up there. Can this be avoided, or shall I resign myself to a semi-annual repair?—D.F.M., Illinois

A Quite a common problem according to the number of letters we've been getting, but it's now curable, thanks to Ford. Seems that the cause of it is the rear head bolt that controls the flow of oil to the rockers and valves. It has a way of clogging up, so oil doesn't flow and what's already there sludges up. Here's what to do.

Get that system thoroughly cleaned out so no sludge remains in and around the valve train. Replace the old rear head bolt with a new one (part number C1GY-6065A). It has a bigger slot and shouldn't clog. Finally, revise your engine oil change policy. Instead of changing it once every 4000 miles, as originally recommended, you'd best have it changed once every 2000 miles and replace the oil filter cartridge every 5000 miles.

Q What would make windshield washers malfunction although you can hear that pump clicking away? The hoses are clear—not crimped. The car's a 1962 Chevy.—M.A.B., Michigan

A A part in that pump's gone bad, and although you can hear it clicking away it's not pumping wind-

shield washer fluid. There's a little rubber piston in the pump. If it's busted, it won't exert the force needed to get the fluid through the lines and to the windshield. You can have it replaced for a couple of dollars for part and labor. No need to get a new pump.

Q There are holes just below the valve covers at every intake valve of my 1959 Pontiac. These holes go right through to the stems. I'd like to know why they're there and if I can plug 'em up in some way since they draw dirt in, and I'm afraid I'll wear out stems and guides.—T.J.M., Calif.

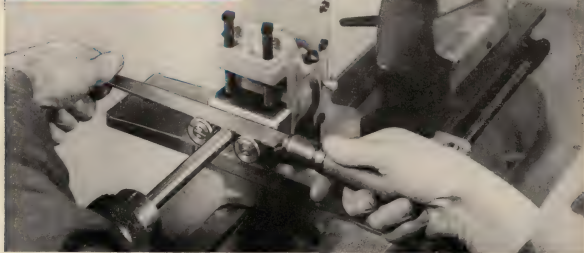
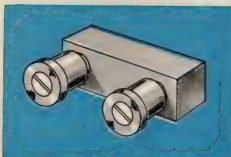
A Those holes were an experiment in "breathing." Pontiac toyed with the idea that putting them there would enhance engine ventilation, but the factory found out, as you did, that they're nothing but "dust collectors." So, a special plug has been issued to plug 'em up (part number 534989). Putting these stoppers in won't affect engine performance or operation.

Monthly Service Tip

If you hear any squeaks coming from your 1963 F-85 with Hydramatic transmission, it could well be the speedometer driven gear assembly. It most likely will occur at low speeds. There are two ways to test to make sure. Warm the car up to operating temperature and drive it at about 25 miles per hour. At this point, shove the transmission selector lever into "N" and turn the engine off. Let the car coast down in speed. If you begin to hear a squeak, you can bet it's the driven gear assembly. Another way to pinpoint this is to remove the gear assembly while the transmission's at operating temperature and rotate the gear by hand. A noisy assembly will drag and squeak slightly. The only thing you can do about a bad driven gear is—replace it.

As a service to Popular Mechanics readers with problems relating to their cars or to driving in general, we invite you to submit your questions for answering through this column or by mail. Address Auto Clinic, Popular Mechanics Magazine, 575 Lexington Avenue, New York, N. Y. 10022, enclosing a stamped, self-addressed envelope.

Roller Guide for Hand Filing

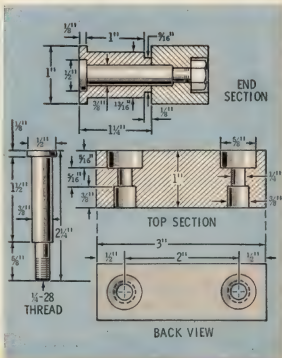


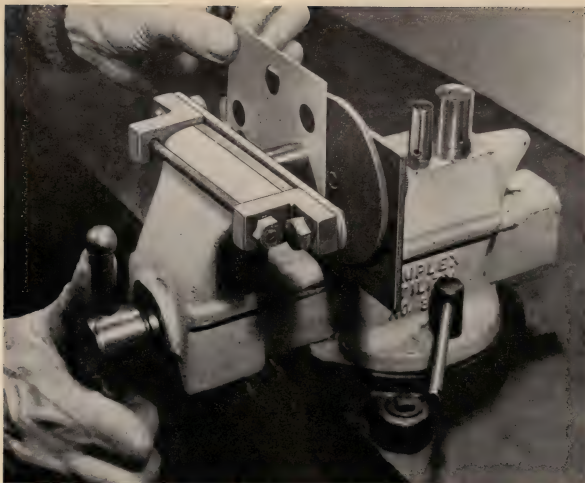
EXAMPLES OF SHAPES WHICH CAN BE FILED WITH THE ROLLER GUIDE

OLD-TIME MACHINISTS did much of their work with a hand filing guide like the one shown here. Clamped in the milling attachment, the guide makes it easy to file octagons, hexagons, squares and many other shapes, as well as sharpen the teeth of end mills, rod drills and spot facers. Accuracy is assured by use of the lathe's dividing head.

The base of the guide is made from 1-in.-square cold-rolled steel drilled and counterbored as detailed. The pivots which support the rollers, are of drill rod, whereas the rollers are made from tool steel. Each roller should be drilled a bit undersize and reamed to its final fit. The shouldered pivots are turned to size, filed smooth and polished for a close running fit in the holders.

To use the guide, lock the headstock spindle with the back gear lever; then select a flat file having parallel edges. Hold the file's safe edge against the guide flanges. As the work nears final size, keep the file bearing on the rollers.





put **punch** in your vise

Add this hollow punch accessory to any bench vise and you can cut clean holes in sheets of leather, plastic and metal

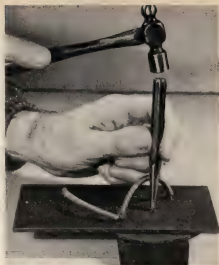
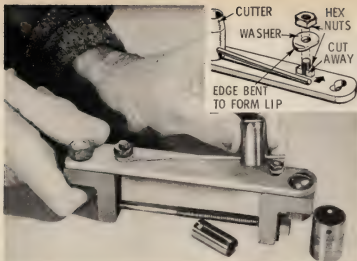
By **Walter E. Burton**

IT'S ALWAYS A PLEASURE to add a piece of equipment to your shop that doesn't cost you anything—especially a gizmo as useful as this one. You can custom-make it from scrap to fit your bench vise. The great pressure you're able to exert with the vise screw lets you punch your way neatly through leather, cardboard, thin plastic or metal sheet, and wood veneers. The easily-made tubular punches let you retrieve the cuttings, if you're making discs or washers. And you can create cutters in many shapes—square, triangular or even cookie-cutter-type designs—from knife-edged steel strip.

The gadget consists of three parts: the

punch assortment, punch holder, and back-up pad. The round punches shown in the photos are sections of tube with the outside of one end filed, ground or turned to form a sharp edge. For greatest efficiency, the tube should be machined on a lathe so that its interior diameter tapers slightly, as indicated in the sketch on the facing page. This permits the cut discs to move easily to the rear, so you can make repeated cuts without clogging.

If you don't have the equipment for machining, you can make the punches by filing or grinding a cutting edge on a length of thin-walled steel tubing, but you should harden and temper the cutting



CHANGING CUTTERS is simple matter of slipping one off pivoting wire, the other on. Free end of wire is tucked against flat-cut nut and held by lipped washer (inset). When top nut is tightened, tension is created on wire to keep cutter in position. Same holds true for block-mounted cutters, below. Right photo shows how rivet is spread for disc pivot. Coil-spring loops pass around vise jaw to hold back-up unit in place

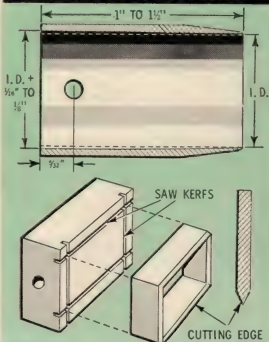
edge. If the tubing is low-carbon steel, use a case-hardening compound. Still another method is to ream out one end of the tube, putting the cutting bevel on the inside and leaving the outside diameter uniform. This is recommended when you must cut accurate holes in fairly thick materials. But such punches will load quickly unless emptied after a few cuts.

An oval punch can be made by flattening a round punch slightly in the vise before hardening. The built-up punches can be bent from any steel strip having one edge sharpened like a knife blade. Printer's cutting rule is most convenient, but you can grind a hacksaw blade and anneal it for bending. Once you've got the shape you want, you fasten the blunt edge of the strip to a drilled block of metal or plywood, either forcing it into matching grooves or seating it in epoxy, metal paste, or solder. The drilling is to let you "string" the finished punch on the holder rod.

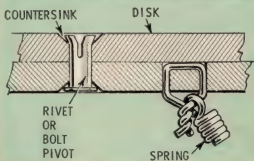
Construction of the punch holder depends on the shape of the vise jaws. The holder shown consists of a $\frac{3}{16}$ x 1 x 6-in. steel bar bracketed to the jaw with two heavy angles on a long $\frac{1}{4}$ -in. bolt.

To protect cutting edges, the material to be punched is backed up by a pad. The one shown is a $3\frac{3}{8}$ -in. disc of $\frac{1}{8}$ -in. tempered hardboard, pivoted on a panel of the same material. The disc revolves to present fresh surfaces, and after the face becomes badly chewed, you just remove the rivet and replace the disc with a new one. The disc could also be zinc, or soft aluminum, and the pivot could be a flat-head bolt, as long as the head is countersunk so that the work lays flat against the disc. A means of attaching this unit to the vise is shown above. ★★★

MAKING THE CUTTERS



ASSEMBLING THE BACK-UP





By Bruce Burk

THERE'S NO DENYING that dovetail joints are the hallmark of fine cabinetwork—and the best joints for drawers and other box-frame assemblies that must withstand frequent movement. They're also among the handsomest of joints, so it's ironical that they're usually tucked out-of-sight. In fact, the whole purpose of a blind dovetail is to be invisible when the drawer's closed! Maybe that's why amateur woodworkers shy away from dovetailing: They figure it's not a skill worth acquiring since the results often don't even show.

So if they use such joints at all, they're likely to settle for commercial router jigs—as do many professional furniture shops. Such jigs produce strong joints, but they can't turn out authentic *through* dovetails, or the neat, square-cut half-blinds used on the drawers of fine old furniture. These prize joints always have been, and always will be, a hand job.

But the easily-made jigs detailed on the following pages spare you tricky layout and fussy cutting with a handsaw. And you needn't invest in any extra equipment—not even a special dovetail bit. The

router templates clamp on the work as shown far right. There's one for cutting both types of drawer dovetails shown above (assembled) and below (separated). These dovetails are wider than you may be used to. Centerlines of the pin sockets can be up to 2 in. apart, depending on the height of the drawer. Sockets wider than the template cutouts must be cut with *two* positionings of the jig, left and right.

The second jig is for cutting multiple through dovetails of the type sketched, bottom right, next page. The end-grain will show on both dovetails and pins when this "through" joint is assembled. It makes a very decorative corner treatment for chests and other small furniture. This jig, or a variation of it, would also be helpful in cutting *single* through dovetails, when assembling frames where extra strength is desired.

Both jigs are designed for use with a $\frac{7}{16}$ -in. diameter router template guide and a standard $\frac{3}{16}$ -in. router bit. This combination makes a cut $\frac{1}{16}$ in. inside the template outlines. If you make the little layout T-square first, you can use it to establish the dovetail angles on the jigs.

Once you've cut your front, back and side drawer members to size—making cer-



tain all end cuts are square—you're ready to put the jigs to work, as demonstrated in the step-by-step photos on the next page. You start by cutting pin sockets on both ends of two drawer members.

With the multiple through dovetail jig, you first establish the socket centerlines at $1\frac{5}{8}$ -in. intervals. The easiest way to do this is shown below. Then you adjust your router depth-of-cut to $\frac{3}{64}$ -in. greater than the combined thickness of the side member and template hardboard. After the pin-socket slots are cut, it's a simple matter to trim back each side at an 8-degree angle to form the dovetails between. (You could save this step by using a tapered dovetail bit, but most commercial types are too short and have too steep a taper for this use.)

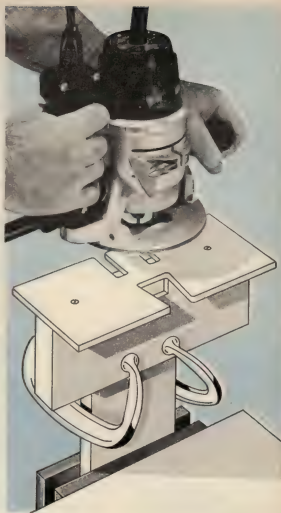
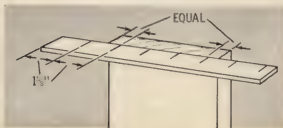
The completed front or back member now becomes the layout template for marking the dovetail sockets on the end grain of the side member. Because of possible discrepancies in cutting, it's always best to mark from the set of dovetails that will eventually be glued into the sockets you're marking—don't mix pieces end for end. If you've cut the template correctly, Cutout B on the pattern, next page, should match the end-grain outlines, fitting $\frac{1}{16}$ in. outside the lines.

Clamp the jig in place, routing the dovetail sockets one-by-one, with the bit at the same setting you already used for the pin-socket slots.

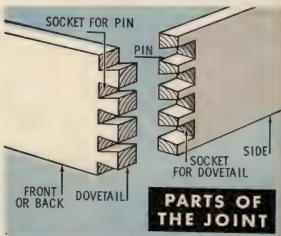
With the drawer jig, the procedure is nearly identical. It's designed for use with standard drawer stock, where the front is usually 1-in. lumber (actual thickness: $\frac{3}{4}$ to $1\frac{1}{8}$ in.) and where sides and back are normally $\frac{1}{2}$ in. thick. Since the dovetails on the front end of the side member normally pass more than half-way through the front member, you must determine the depth of the pin sockets by a special step.

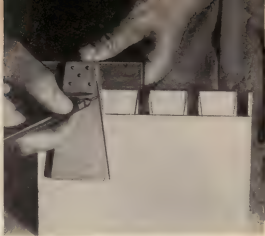
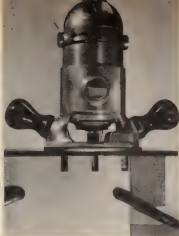
Clamp a scrap piece, the same thickness

TO LOCATE PIN SOCKETS, lay off strip of wood with marks spaced $1\frac{1}{8}$ in. apart. Clamp this strip against face of front or back member, centering maximum number of marks, as sketched below. Transfer these marks to the stock, then scribe them across end with try square. These are centerlines of pin sockets, to let you line up template slots of jig, top right



as your front member, vertically in the vise and clap the jig over the end. Using Cutout D and an estimated bit setting, make a sample socket in the scrap, as shown in the top right photo on page 187. Now, detach the jig and lay the scrap flat on your workbench, socket up. Rest your router on the face, with the bit extending alongside the socket, and adjust the depth-of-cut to the depth of this socket

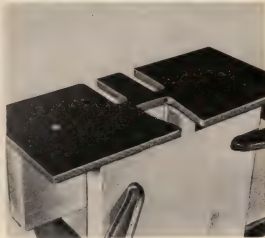




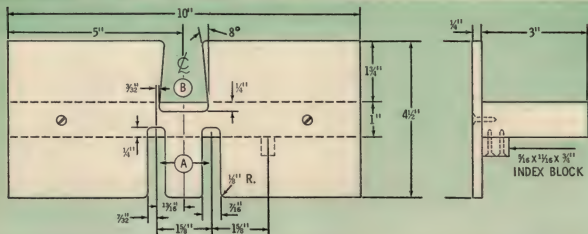
CENTER RIGHTHAND CUTOUT A (see plan sketch below) over pin-socket centerline and anchor with two C-clamps (left). Rout first socket, then shift jig to insert index block in cut (center) and rout next two sockets. Proceed this way across stock; when all are routed, lay out dovetail shapes with T-square jig (right)

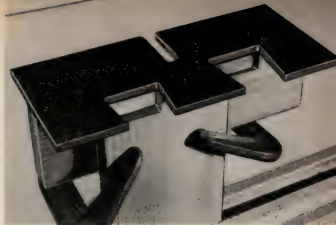
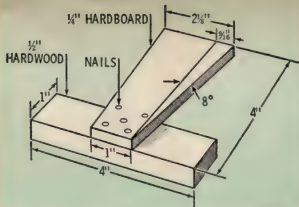
HOW TO USE THE THROUGH-DOVETAIL JIG

COMPLETE DOVETAILED EDGES ON JIG SAW (left) or bandsaw, by trimming small wedges off each side of pin socket. Lay dovetailed edge over end of side member and outline dovetail sockets with sharp pencil (center). Align Cutout B with marks, clamp jig, and rout (right), then move jig on to next position and rout again



THROUGH-DOVETAIL JIG consists of tempered hardboard template attached to hardwood to form a T. Small hardwood block is added to position the pin-socket slots (A). Note that all slots lap into hardwood $\frac{1}{4}$ in.—this is necessary to cut through stock, since router's guide collar holds cutting bit away from end (and edges) of slot. Bit will still pass into hardwood, forming its own clearance notch first time you use jig





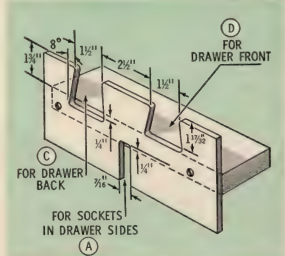
WIDER DRAWER DOVETAILS take special jig. Here it's positioned for cutting blind sockets in front member. Align Cutout D with dovetail outlines (below)

BLIND DOVETAILING

CUT AND OUTLINE wide, blind dovetails in same steps shown on facing page—except that dovetails at end of sides are shorter than front member is thick



DRAWER JIG is assembled like first one, but has cutouts of different depths to handle blind dovetails on drawer fronts and through ones on drawer backs. Cutout C laps into hardwood, as does A



plus the thickness of the hardboard template. This will be the proper depth for the pin sockets in the side members.

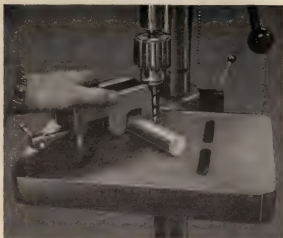
Mark the center lines for these sockets and cut the slots for them. Since fewer are involved and their spacing may vary, this jig provides only one slot and dispenses with the index block. You simply center Cutout A over each centerline scribed across the end grain of the side member. Finish the shaping of the pin sockets on the jig saw, as before, after laying them out with the little T-square. Transfer the resulting dovetail pattern to the end of the front member and position Cutout D around these lines. If the drawer side is to set flush with the end of the front member, set the router's depth-of-cut to the combined thickness of the side and template. If the drawer front is to be lipped, increase the depth-of-cut accordingly. After routing the dovetail sockets, sharpen the rounded corners with a small chisel.

Some shaving may be indicated by your first trial fitting. You don't, of course, assemble any of the joints until all dovetails and sockets are cut on both ends of each member. Then you carefully spread glue on all butting surfaces and slip the joint together. Just as you can assemble it only one way, there's only one way for it to break apart. Where the joint must withstand stress, be sure to design it so that the stress won't be applied in the direction of assembly. Look again at the sketches at the bottom of pages 184 and 185. The stress of opening and closing the drawer would tend to separate the joint directly forward and backward, and this is impossible since the joint can only separate toward the side.

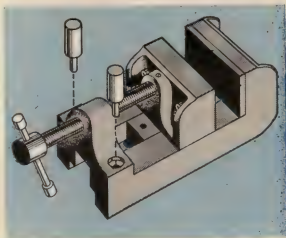
Stress is of less concern when assembling the multiple through dovetails of a piece of furniture, so the joint may be turned for its best decorative effect. Once you've sanded it down and applied a natural finish to emphasize the grain contrasts, you'll have a joint that echoes the golden years of fine hand cabinetmaking.

And it won't look machined. ★★★

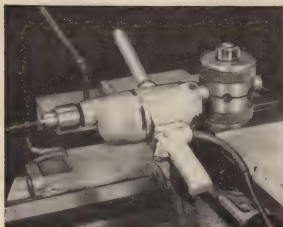
For Tricky Jobs, Flip Your Drill-Press Vise



THOUGH IT MAY SEEM odd, turning your drill-press vise upside down makes some jobs a lot easier. For one thing, when you're drilling round stock, if the work is placed in an inverted vise as shown, the drill press table provides extra support and assures that the work will be at right angles to the drill. The stunt is equally effective when working with long rod stock on a metal cutting bandsaw. In this case, the vise keeps the rod from turning and



possibly snapping the blade. Also, because the vise is inverted the work is supported along its entire length by the bandsaw or drill-press table. I modified my vise by facing a spot on each side of the frame at the handle end, using a $\frac{1}{2}$ -in. end mill. Then, I center-punched each flat spot and drilled a $1\frac{1}{4}$ -in. hole, $\frac{1}{2}$ -in. deep. After reaming the holes with a $\frac{1}{4}$ -in. bit, I inserted two shouldered posts turned from $\frac{1}{16}$ -in. steel rod.—Stanley Burwell



Automatic Lathe Drilling

I found that by replacing the rear handle of my $\frac{1}{2}$ -in. electric drill with a pipe adapter, I can mount the drill in the boring-bar holder of my lathe. So held, I can feed the bit to the work automatically by simply engaging the carriage lead screw. With the drill bit chucked in the drill rather than in the lathe tailstock, I am also able to perform boring operations with both the work and the drill bit rotating which results in extremely accurate drilling. Here, again, the drill can be power fed by engaging the carriage lead screw.

—H. J. Gerber



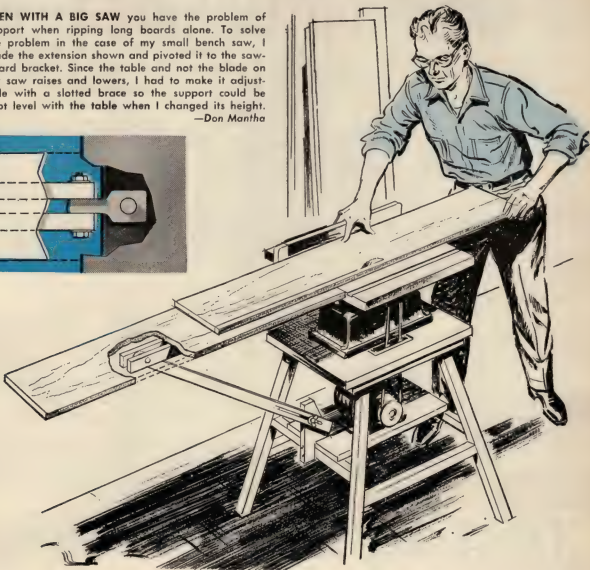
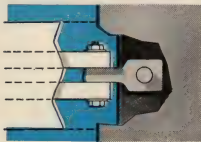
Keeping Allen Wrench Handy

Due to its small size, the Allen wrench used for locking the compound swivel of a lathe has a way of becoming lost just when you need it. You'll spend less time looking for it if you take the time to braze it to the handle of your tool-post wrench. Aside from having it right with the tool-post wrench all the time, you'll also find it easier to use since it now has a better grip. If you prefer to have the two wrenches separate, you can achieve the same result by brazing the Allen wrench to any short length of steel rod.

Outboard Ripping Support Adjusts Along with Table

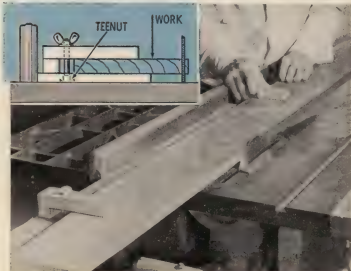
EVEN WITH A BIG SAW you have the problem of support when ripping long boards alone. To solve the problem in the case of my small bench saw, I made the extension shown and pivoted it to the saw-guard bracket. Since the table and not the blade on my saw raises and lowers, I had to make it adjustable with a slotted brace so the support could be kept level with the table when I changed its height.

—Don Mantha

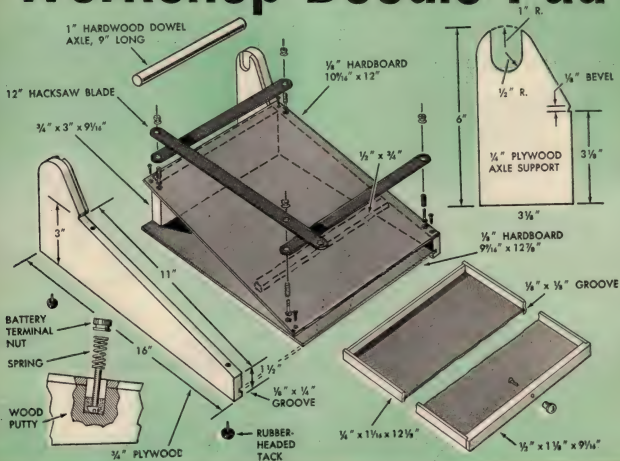


Clamping Jig Holds Rough Boards for Truing Undressed Edges

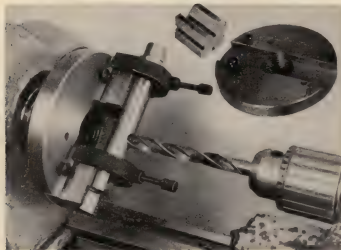
Recently I had a chance to obtain a good price on some walnut boards which were surfaced but not edge-dressed. But before I could work with them I had to think up a way of clamping the boards to a straightedge so I could true one edge on the saw. Here's what I did: I took a $\frac{1}{2}$ x 6-in. straight board about 8 ft. long and by means of Teenuts embedded on the underside, I attached two hold-down clamps to the board in the manner shown in the detail. As you see, the hold-downs, when tightened by wing-nuts or thumb bolts, clamp the work to the straightedge.—F. Greenwald



Workshop Doodle Pad



Lathe Drilling Setup Is Self-Centering



CROSS DRILLING and boring of short pieces of shafting is easy to do with this jig made from a faceplate and two V-blocks. If care is taken to center the groove when milling it exactly across the faceplate, the workpiece will center automatically. Heads of screws hook in slots to clamp V-blocks to faceplate.

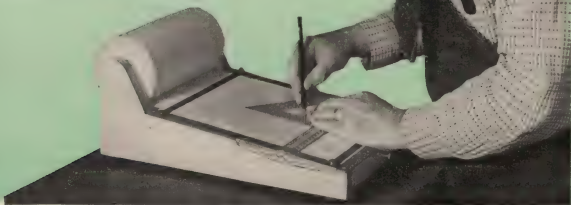
ACCURATELY drilling a hole through the diameter of a shaft is tricky because the work is difficult to hold, and where precision requires that the hole be finished by boring, the job may become an almost impossible one.

The jig shown in the photograph makes drilling, boring or tapping of shafts or rod stock just another routine operation. To make the jig, you'll need a spare lathe faceplate and a pair of V-blocks. A slot just wide enough to accept the V-blocks is milled across the faceplate. The width of the slot is critical; if the blocks are a loose fit, accurate work will be impossible. The faceplate is tapped for four 1/4-20 button-head socket screws which bear against the clamp slots in the sides of the V-blocks.

FIGURING OUT shop projects on a doodle pad before you actually begin to work can save you hours of time and plenty of valuable material.

The sort of pad you use doesn't really make much difference, but the one shown here offers some novel features. For one thing, it has a drawer to hold triangles, pencils, and compass. Its large paper roll affords a long lasting supply of stock for project designing or material lists. When a drawing is completed it may be neatly removed from the roll using the tearing edge provided by a hacksaw blade.

Both side members of the affair will be identical by stacking and sawing both at the same time. The parts are assembled with glue and nails. The paper roll is 8½ x 4½-in. and is the type used in teletype-writers. It is available at office supply stores.—Howard R. Clark



NEXT MONTH IN SHOP AND CRAFTS

- ★ **NEED A GARAGE?** Don't build one until you see our garage bonanza in the April issue. We commissioned an architect to come up with fresh new ideas in garage design, and wait 'till you see them! More than just a place to park a car or two, these new designs include built-in cookout areas, patio decks and storage walls. To show you how to build your own, we had one of the designs built. We photographed every step from the ground up, we've detailed every joint and for the next four issues we're going to show you every step of the way. Don't miss Part I in the April issue
- ★ **ISLAND ENTRY DIVIDER.** Does your front door open directly into the living room? In the April PM you'll discover plans for a tasteful room divider that can turn a corner of the room into a traditional entry. On the entry side, visitors are welcomed with a view of louvered doors and polished panels, while the room side is an L-shaped unit made up of a tall bookcase and roomy storage cabinet. Watch for the plans in next month's PM
- ★ **CANNED GOODS CABINET.** Though it's only 3 ft. wide, this ingenious counter-height cabinet provides storage for as many as 100 cans of food. With shelves only 5-in. deep, it's impossible for anything to be shoved back out of sight. If you're interested in finding out just how this storage miracle is accomplished, read the how-to-build-it article in April
- ★ **REMODELING WITH DRYWALL.** If you're expecting the same old how-to-install-drywall story, prepare for a surprise. Some exciting things have been happening to wallboard. For instance, you can panel a room with drywall "wood" for far less than you'd pay for wood paneling. Or repair badly scarred walls by covering them with new super-thin wallboard panels designed just for this job. Don't miss Part I of this two-part article next month

BIG REELS

For Little RECORDERS

By Clyde Steiner

DON'T BE BOUND by the 3-inch limitation built into your portable tape recorder. This handy adapter will play 7-inch tapes.

We used a chopping board for a base, but a sheet of $\frac{3}{4}$ -inch plywood will work as well. Make sure it is large enough to support your recorder.

Bend the extension bracket. Make sure the finished unit is long enough to allow room for the 7-inch reels which will sit on it. Its height should be approximately that of the tape recorder. Small differences can be adjusted by placing appropriate shims under the recorder.

The extension reel support pulleys are standard empty 5-inch tape reels with solid rims. Three-inch reels are used as drive reels from the recorder. Don't use the new easy load reels for either of these as the slits in the rims will catch the drive belts when in use.

Spindles for the support pulleys are made from discarded ball-point pen housings. Check the reel against the housing for a good fit. Brass 8-32 bolts are used as spindle axles. The pen cases slip into place over them and should spin freely but should not wobble.

Extension reels can be handled two ways. Cement the 5 and 7-inch reels together as shown or cement the 5-inch reels to the pen cases and press fit the 7-inch reels.

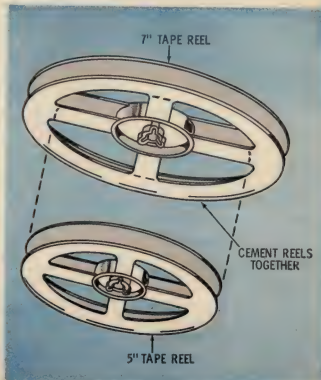
Now tie the string operating belts into place. They run around the 3-inch reels on the recorder and the 5-inch reels on the adapter. Use figure eight slip knots at first so they can be adjusted. Do the takeup reel first. With the tension control arm centered tie the belt tight. Now do the rewind belt, but leave a little slack here.

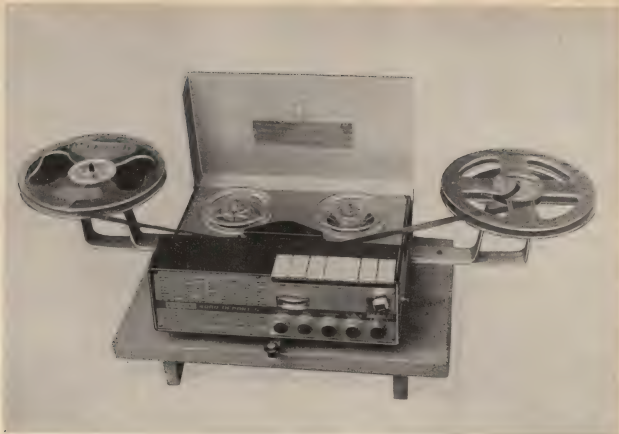
Now thread tape through the machine and turn the recorder on "play." If the recorder does not operate properly, adjust the drive belts and control arm till it does. Then tie the drive belt permanently.



UP TO EIGHT HOURS of music can be played on a portable tape recorder if you use this adapter jig to allow for outboard mounting of 7-inch tape reels

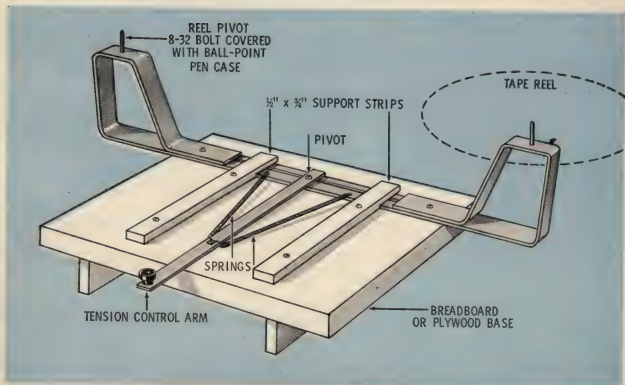
EXTENSION REEL consists of a 7- and 5-inch reel stacked and cemented together as shown. Drive belt from the recorder goes around the small reel





HERE'S THE RECORDER sitting on the adapter. Note that you may have to vary adapter size to suit your particular recorder. This is why no detailed dimensions are given in the diagram below, that illustrates the device

DETAILED SKETCH of the adapter. The hardest part is to bend the aluminum strip that holds the reels. Also, make sure it slides easily under the support strips. The springs are ordinary screen door types cut to fit



Have Fun with an Electronic Jumping Jack

Hopping endlessly up and down on its track, the jumping jack will amuse your friends—and have them wondering why it goes

By A. J. Molinara

IF YOU LIKE GADGETS that amuse and amaze, here's one you can't afford to miss. A flip of the switch and a little disc hops up and down, a captive on a shiny brass rod.

What's the secret?

The electronic jumping jack consists of a specially wound coil energized by pulses of current from a timed power supply. Every time current is applied to the coil, the round disc (a ceramic magnet in disguise) is shot up the rod. When the current is turned off, the magnet drops down again only to shoot up the rod the next time the current is applied to the coil. This process continues as long as the power stays on.

The coil core must be made of either iron or steel. I used a steel spacer post from an old washing machine and turned it down to the dimensions shown in the diagrams. You can start with a piece of steel rod.

Rest on the Shoulders

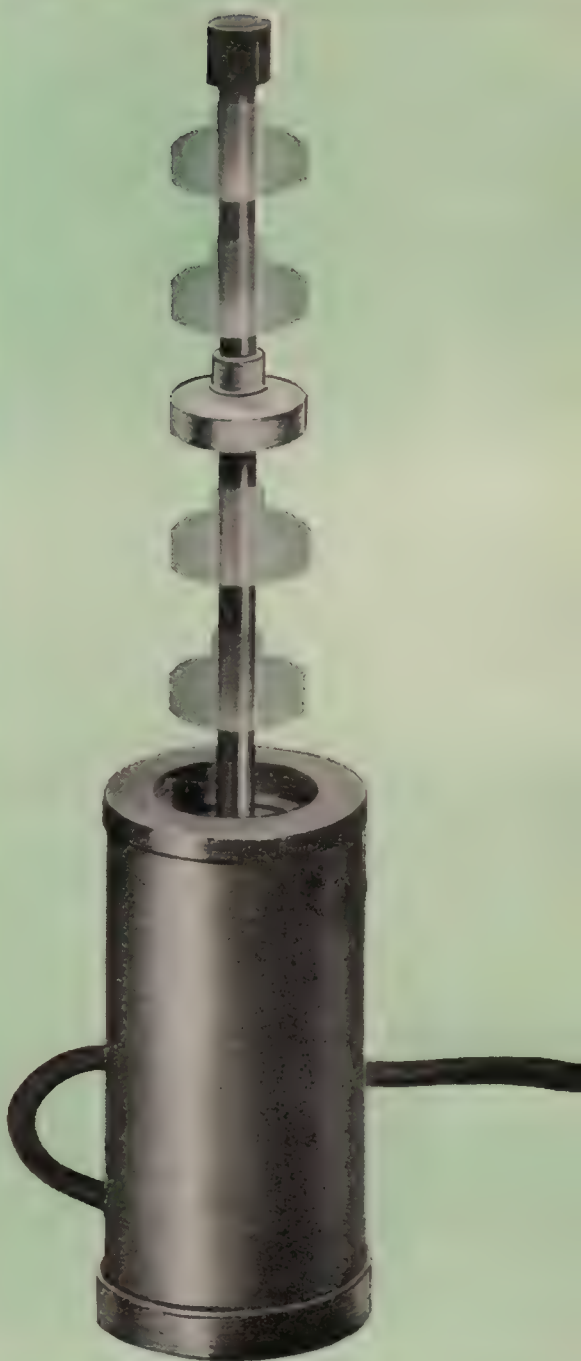
The top and bottom ends of the coil form slip over and rest on the shoulders of the core. The chamfers on the ends leave space for the epoxy cement that holds them in place. Let the cement dry overnight before winding the coil itself. When winding the coil fill the coil space entirely.

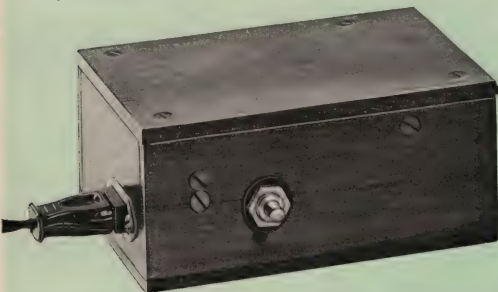
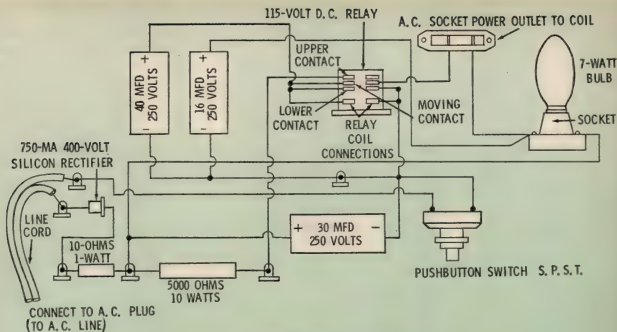
I made the coil ends from surplus phenolic discs, but almost any kind of insulating material (plastic or wood) can also be used. My center post is made from a brass rod. This material seems to work out best here. Again, almost any nonmagnetic material could be used. Aluminum would make a good substitute, but may be lacking in strength. Whatever you use,

polish its surface carefully making sure it is as smooth as possible.

The magnet is a ceramic disc unit that is polarized along its axis. It can be purchased from the D. M. Steward Manufacturing Company, P.O. Box 510, Chattanooga, Tenn. Order their part No. 1434. Use only a ceramic magnet here. Other types tend to become demagnetized in a very short time.

The magnet housing is made of one of the smoother plastics; nylon or Teflon is excellent. It also doubles as a bearing for





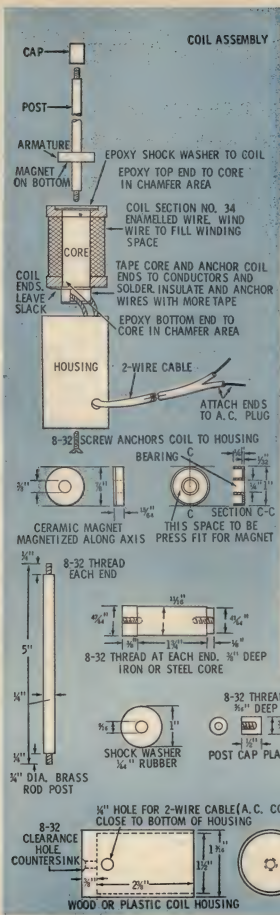
CLOSEUP of the jumping jack. The pictorial diagram of the power supply must be followed carefully. Mount the pushbutton switch in some convenient spot. The plug on the side of the power supply is from separate coil assembly

the magnet as it rides along the rod during its up-and-down travels. As magnet dimensions may vary, you may have to tailor the housing to fit. Try for a tight press fit, and if this doesn't work, use epoxy cement to hold the parts together. The magnet has a small chamfer on one side. Leave this side facing out of the housing.

My coil housing was made from the leg of an old maple chair. However, it can be made from any nonmagnetic material. A length of plastic tubing would be fine.

The nonmagnetic material is required so the housing has no effect upon the coil.

When finishing off the assembly of the coil, first insulate the bottom part of the coil core with electrical tape. Then clean the coil ends and solder them to the stripped ends of a five-foot length of dual-lead lamp cord. Insulate the connections again with more tape and anchor the wires in place with another piece of tape. Feed the lamp cord through the housing and out the hole. Then, while pulling the cord out, carefully lower the



coil down into the housing. When the coil is seated fully, fasten it into place with a flat-head screw.

Now take the rubber shock washer and cement it into place atop the coil assembly. Use epoxy cement here. When it has hardened assemble the remaining parts.

Now the power supply must be assembled. Follow the pictorial wiring diagram carefully. If possible use a wood or plastic case. In this way you can match the coil housing. Also you avoid any possibility of electrical shock. If you do use a metal case be sure that no hot leads contact the case. Use terminal strips to insure isolation of wiring.

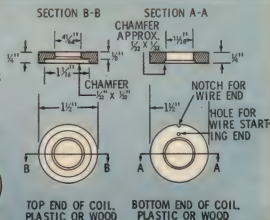
Capacitor Sets Timing

The power supply is designed to deliver current pulses at intervals that permit the magnet to jump up and down at a fairly rapid rate. The capacitor connected across the relay coil determines the timing of the pulses. A change in its value will change the timing of the pulses. Be sure you do not get too short an interval or the magnet will never get a chance to return to the bottom of the guide rod before the next pulse comes along.

Once all construction has been completed plug the cable from the coil into the power supply. Then plug in the power supply and turn it on. The relay should begin to cycle (open and close) immediately. The 7-watt lamp should flash each time the relay closes. If the magnet does not jump up and down, reverse the plug from the coil. Mark this polarity so you can remember it the next time you use the device.

Once you have built and operated the electronic jumping jack, you'll have a great time showing it to your friends. ★ ★ ★

DETAILED CONSTRUCTION VIEWS of all parts of the jumping jack. Follow diagrams and text to assemble





It only feels downhill all the way . . .

We tipped the camera to capture the exhilarating swoop of a Johnson Boat in action. It gives you some idea of the way it takes off with our 150 hp V-6 providing the push. With skiers, this engine has pull — zero to ski speed in 5 seconds. Cruising buffs appreciate its fuel economy. There's a peppery 120 hp straight-4 and a compact 88 hp V-4 available, too. Order "full speed ahead" with any one of the 3 Johnsons and get it! They all make the water seem slicker somehow. ■ Our wide-track hull planes on three dart-shaped surfaces like a racing hydro, yet it has the stability of a catamaran — keeps level in tight high-speed turns, crosses wakes without tripping, won't tip under lopsided loads, at the dock or on the go. ■ Luxury-yacht comfort tops

off the Johnson Deluxe — cushioned shock absorber seats, power-operated windshield, built-in storage space for everything, a convertible top that goes up almost as easy as an umbrella, a flat snag-free floor. ■ Whatever your boating pleasure, you'll have a lot going for you. And you'll be going a lot. Point of departure? Your Johnson Boats dealer. ■ 3 Models for 1965. Stern Drive or Outboard Powered.

Johnson Boats
First in **DEPENDability**

Division of Outboard Marine Corporation, Waukegan, Ill.
Write for Free "Boat Ride" Brochure! Address Dept. PM-52

Sure, this GMC pickup costs \$49* more than others. But look at it this way.

Progressive leaf rear springs automatically adjust to the load. Heavy loads, light loads or no load at all, the ride's slick as silk.

Husky wood floor is quiet and long lasting. None of that annoying drumming and rusting.

Two walls of steel and a thick pad of insulation keep the GMC cab strong, quiet, comfortable.

No tangle of wires behind the instrument panel. In its place is a printed circuit. Only GMC has it.

The exclusive V-6 truck engine has gone 120,000, 130,000, even 150,000 miles before major overhaul. About half that is average. But the V-6 isn't just an average engine.

GMC offers a proven total suspension system of independent front and progressive leaf rear springs. Result? Always a smoother ride even with maximum loads.

*Based on manufacturers' suggested retail prices, the GMC V-6 model pictured above is never priced more than \$49 over comparable competitive base models. Often the difference is less.



Tires are king-size (8.15 x 15). Yet they're standard equipment. Others charge extra.

You can clearly see this is a superior pickup. GMC has 4 headlamps. Most others have only 2.

Three letters that stand for three important things. Built by truck people. Sold by truck people. Serviced by truck people.

See? More truck for your money!

Polysulfide Sealants

(Continued from page 163)

when you apply the sealant, put the tape in place before you brush on the primer. Let the first coat dry for about an hour at room temperature; then apply a second coat. Allow the two coats to cure for 24 hours at room temperature, longer if temperatures are below 70 degrees.

Primers should also be used on concrete, tile, brick and other porous materials, to improve the seal. Here, again, the primer penetrates the surface to build a thicker, solidier base for the sealant. Since primers turn brown on exposure to sunlight and are difficult to remove, be careful to keep your application within the joint area.

Most one-part polysulfide sealants don't need a primer to aid bonding to metal, glass or glazed tile. All of these surfaces, however, must be clean.

Surface Preparation. Loose dust, old caulking material, oily or bituminous residue of any kind, or other coatings on a surface, can prevent polysulfide rubber sealants from bonding tightly. But since the rubber sealant will last for life if put on right the first time, you can afford to spend more time cleaning and preparing the surface.

Joints around a house should be about $\frac{1}{4}$ in. deep by $\frac{1}{4}$ in. wide. Seams on boats or at locations around the house that may move more than about $\frac{1}{8}$ in. should be wider. A rule of thumb for figuring joint widths is to multiply the expected joint movement by three. For example, if a joint between the wood framing and the fireplace is $\frac{1}{8}$ in. wider in the winter than in summer, make the joint at least $\frac{3}{8}$ in. wide. If the joint is already $\frac{3}{8}$ in. or more wide, stuff flexible tubing or closed-cell sponge of vinyl or rubber into the joint until the space left for the sealant is just as deep as the width, or $\frac{3}{8}$ in. deep for this example. The chart on page 161 shows how much sealant is required for seams of various sizes.

When replacing old, aged caulk or putty on an outside seam, there's no problem with oil from the old material soaking into wood and loosening the seal between the rubber sealant and the wood. However, on new window installations or if an entire window is replaced, the use of putty to bed the panes might affect adhesion. So, instead of putty for bedding, use one of the backing tapes listed in the selection chart. Sketches on pages 158-9 detail how the dry side and edges of the glass rest in the tapes. The selection chart lists the all-rubber type, either polysulfide or butyl base, and impregnated felt tapes.

Small-pane windows normally installed with putty chamfered to a 45-degree angle can be installed with polysulfide sealant, but the many panes use a large quantity of the material, and trimming the sealant to an even angle requires considerable skill. For deep fillets of sealant, a triangular wood filler, seated in sealant as sketched on page 159, simplifies getting an even trim and reduces the quantity of sealant required. Just apply a bead of sealant to a clean corner, press the filler strip into it and trim away squeezed-out sealant. Miter the ends of the filler pieces and fit them to openings before applying sealant. When the sealant has skinned over, wood and sealant can be painted to match the window frame.

The easiest way to remove all old oil, caked caulking or paint is to saw a slight kerf along the rear edges of window battens as sketched on page 158. When the batten or other facing strip cannot be taken off easily, remove all of the old putty with a beer can opener or linoleum knife. As a final step, shave off a thin layer of wood with a utility knife or chisel. When caulking a batten around a house or boat window, leave a space at each end to fill with sealant. Remove any paint or finish down to bare wood from the space opposite the batten end for a good seal between these members.

What Else Needs Priming?

Ordinarily, around the house, wood surfaces need not be primed because they are not constantly immersed in water. However, on a boat either below or above water line, priming the wood before squeezing in rubber sealant will extend the life of the joint. PRC's package of Marine Rubber Caulking includes enough primer for use with each tube of sealant.

Before priming stone, concrete, tile and similar materials, all traces of oil, old paint or putty and loose dust or particles should be removed. Scraping, sandblasting or brushing with a stiff wire brush is normally all that is needed to prepare stone and brick surfaces.

Glazed tile, glass, non-porous marble and metals require no priming, but these slick surfaces must be absolutely clean to assure a tight bond with the sealant. Any old caulking or paint should first be scraped off with a razor blade. Just before you're ready to squeeze on the sealant, clean the surface with a clean cloth dampened with trichloroethylene or MEK. Wipe off the solvent with a clean cloth before it dries. Any corrosion-preventive coating such as lacquer must be removed from aluminum window frames.

(Please turn to page 200)



Good deal

Tilling and cultivating is faster, easier than ever with new Simplicity SUPERMATIC Roticult! To its tireless 4 hp "go" is added an all-gear reverse with pushbutton fingertip control for greatly increased efficiency with very little effort. Roticult's scientific slow-speed tilling action crumbles toughest soils without damaging soil structure. Self-sharpening tines stand off punishment. Releasing handle grips automatically stops machine. Also available: 3 hp economy version Roticult.

Good dealer

Your nearby Simplicity dealer is proud to stand behind the machines he sells—America's No. 1 line of power equipment for lawns and gardens. And he's anxious to help you gain and maintain peak performance, with dependable service. Ask about his convenient budget terms.



Simplicity Manufacturing Company
6540 Spring St., Port Washington, Wis.

Polysulfide Sealants

(Continued from page 199)

Application. Once the joint surfaces are cleaned (and primed if necessary), applying the sealant is similar to the application of any caulking material. However, because the polysulfide rubber sealants cure chemically, either by absorbing moisture or from an accelerator added to the base material before application, the sealant is more fluid and is easier to work. In fact, one of the big bonuses when caulking boat seams is the ease and rapidity of squeezing in rubber sealant. Instead of knifing in thick, hard-to-work marine caulking, the rubber sealant can be gunned in and smoothed out accurately with a putty knife.

One hint about cleaning up. Polysulfide rubber sealants are plenty sticky, and they will cling to your skin with the same tenacity as to wood and stone. In fact, if the sealant remains on your hands for a few hours, you'll have to let it *wear* off. So, before starting to work with the sealants, rub several layers of thick soapy paste on your hands—unless you prefer to wear gloves. You'll need this paste anyway in trimming the sealant, as shown on page 159.

Now, About Those Tubes

Polysulfide rubber sealants are available in sealed cardboard tubes that fit into a standard tube caulking gun. Polyethylene tubes, on the other hand, must be used with special hand- or air-operated guns. Once emptied, the polyethylene tubes can be cleaned and reused. Cured sealant can be rubbed off these tubes like rubber cement off paper. Individually packaged tubes of the rubber sealant cost more but are handy when only small quantities are needed. When using more than two quarts of the sealant, purchase of a gun that fits the reusable plastic tubes will pay off. Sources are given in the selection chart.

Individual tubes can be loaded from bulk packages by first knifing material from its container onto a smooth surface, such as glass, plastic laminate or hardboard. With a wiping motion cut off portions of the sealant with the tube edge and force it up into the tube. Leave enough space for the plastic cap to fit into the end. Sealant can be worked down into the tube by holding it upright and kneading the tube gently between the fingers. Allow any excess sealant to flow out the nozzle end back onto the pile of sealant on the loading board. Since it is easier to keep your equipment clean than to clean

(Please turn to page 202)

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When You Buy CHANNELLOCK Adjustable Wrenches you buy the finest—at no extra cost. CHANNELLOCK wrenches are drop forged of special analysis steel . . . heat treated for maximum toughness and proper hardness of working surfaces . . . chrome plated . . . built to last. Available also with blue dipped plastic cushion grip handles. Specify CHANNELLOCK adjustable wrenches . . . you'll be glad you did.

CHANNELLOCK, INC. Meadville, Pennsylvania

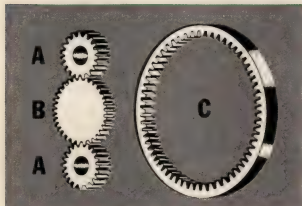
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Test your automotive I.Q.



Name the gears in this planetary set.



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A. Planet gear. B. Sun gear. C. Ring gear. The life preserver stands for Quaker State Motor Oil—the best engine life preserver for your car. Made from 100% Pure Pennsylvania Grade Crude Oil, Quaker State keeps your car on the road and out of the repair shop. Insist on this quality protection—by name. Quaker State your car—to keep it running young.



QUAKER STATE OIL REFINING CORPORATION
OIL CITY, PENNSYLVANIA

Polysulfide Sealants

(Continued from page 200)

it later, wash off any excess sealant around the cap with a brush dipped into a can of solvent. Use the same brush and solvent to clean your putty knife, parts of the caulking gun and the loading surface.

Plastic nozzles screw into the ends of the plastic tubes. By cutting off the end of the nozzle at an angle, you can control the flow of sealant into the groove. The end of the nozzle should be small enough to reach the bottom of the seam so the sealant can be deposited from the bottom up. Don't worry about an uneven surface on top while squeezing in the sealant, as the surface will be smoothed and trimmed later. A little practice is all that's necessary to know when there's enough sealant to fill the seam with least waste.

On a flat seam, smoothing can be done simply by drawing a putty knife over the surface and forcing the sealant into the seam. Any sealant that spreads to either side of the seam comes off with the masking tape to leave a smooth, even joint. Since there is negligible shrinkage with the rubber sealant, no excess material need be left for trimming later. If any excess sealant remains after curing, it can be sliced off with a razor blade or sanded flush with the surface.

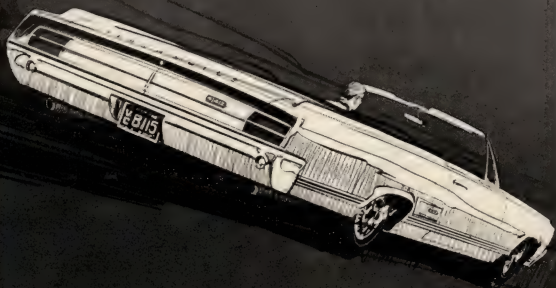
Trimming Window Beads

Around windows, brush the surface of the sealant bead with your soap paste before trimming, then shape the bead into a smooth, even seam that is parallel with the batten face on vertical joints and is slightly angled along horizontal ledges. The slope will allow water to drain off the joint after running down the window.

On joints $\frac{3}{8}$ in. and wider, make two or more passes with the gun to fill in the space. Succeeding layers of the rubber sealant will bond perfectly to previous beads. As much material as necessary can be laid in without fear of shrinkage cracks developing because of the negligible reduction of volume as the sealant cures. Wide seams cure to a long tough joint of resilient rubber.

Cured seams of rubber sealant can be patched or expanded easily by first trimming away any excess sealant. New rubber sealant is then squeezed into the seam where it bonds onto the cured rubber. Bubbles or voids that show up after curing can be cut out and patched in this manner.

A second article, concentrating on the marine applications of these wonder sealants, will appear next month. If you are a boat owner, don't miss it. ★★



Olds **442**
 New package
 of instant action:
Color it cool!

4-4-2 Convertible shown. Also available in F-85 V-8 Coupes.

Ready? Go! Color that Rocket action V-8 400-cubic-inches *big* . . . and 345-horses *eager!*
 Color the four-barrel carb *neat* . . . the acoustically tuned, chambered twin pipes *sweet!*
 Now we're moving with heavy-duty frame, shocks, front and rear stabilizers
 (color the curves *flat*) and four heavy-duty coil springs (color the bumps *gone*).
 There are three spirited transmissions available: color Jetaway *easy*, the close-ratio
 four-on-the-floor *potent*, the three-speed synchromesh *smooth!* And color the price
low (starting lower than any other high-performance car in America
 designed for everyday driving!). We've already colored
 the tires with a slim red line. Nice job. Now why not
 compare it with the original at your Olds Dealer's!

'65



OLDSMOBILE

The Rocket Action Car!

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We've got something against nails.

(That nobody else has got.)

It's our newest Ranger. The Carpenter's Shoe. And it's got some things that no other utility shoe in the world has.

First. A *steel arch protector*. Other

shoes try to protect the sole. But only halfway. You're only half-safe. Ours has an impenetrable steel wall at the instep where nails often find their way.

Ours also has a *one-piece steel support* that runs the full width of the shoe, *without a break*. So protection from nails and other sharp objects is complete.

(None of those old "venetian blind" slats that allowed things to slip in.)

And above it all is wall-to-wall carpeting. An Air-tuff® cushion sits there, and your foot sits on top of it. It's as soft, as light as the finest carpeting.

Here are some other vital statistics on our Carpenter's Shoe. It's made of oil-stained glove leather. It's got a seamless back. A Permacounter. A storm welt. And an oil-resistant Miragum sole and heel.



Got the picture?
Get the

Carpenter's Shoe.

Look for it, and other Rangers, at the store nearest you or write for name of nearest dealer. America's largest-selling utility shoes start at 8.95.

Table-Top Plant Stand

(Continued from page 171)

would have served. The drum must turn easily in the holes bored through the two supporting uprights.

To maintain spacing of the uprights, increase rigidity and prevent binding of the windlass, it's a good idea to install a couple of braces paralleling the tube. Aluminum table edging is ideal for this purpose but a 3/4 x 2-in. wooden strip may be used instead.

The windlass is turned by grasping a knob cut from 3/4-in. maple. A pin or setscrew is used to secure the knob to the tube. Turning the windlass winds up or lets out two lengths of picture wire from which the lamp unit is suspended. The ratchet and pawl locks the windlass to hold the lamp at the desired height. The ratchet wheel must be fastened securely to the tube, about 1 in. from the hand-wheel. Position the pawl by trial, so that it engages and disengages the ratchet notches smoothly. The spring holding the pawl in the ratchet notches is bent from music wire. To lower the lamp, disengage the pawl by pressing its outer end while grasping the knob with your other hand.

Some lamp units are fitted with eyelets so that they may be suspended. Lacking these, bend two hooks from coat-hanger wire and fasten them to the picture wire. Attach the other end of each wire to the windlass-drum. The wires must wind in a single layer, without overlapping.

Some manufacturers produce special lamps for the purpose, such as Sylvia's "Gro-Lux" fluorescent and the Westinghouse "Plant-Gro." These lamps have high red and blue radiation. The red stimulates vegetative growth; the blue helps to regulate chemical and enzyme processes. General Electric, on the other hand, recommends its standard cool white fluorescent for plant growth, though in some cases it may be necessary to supplement the fluorescent with incandescent lighting. One advantage of fluorescents used alone is coolness. There is no danger of scorching delicate flowers.

For safety, it's best to ground the fixture by running a sizeable wire from the reflector or some other part of the housing to a water pipe. This is a must if the planter is to be used in a basement or other damp location. A time switch of the type used for controlling electric signs is handy for automatic intermittent operation of the lamps.

The correct lamp-to-plant distance may be found by experimentation; for seedlings, try 6-in. Larger plants usually grow best with the lamp a foot above. ★★



a Merc doesn't disturb the peace

There's a new sound on the water for 1965... a new quiet sound, 50% less than before. It's the sound of the new 1965 Mercs. Silencing came, primarily, from two new principles:

- Engine cooling water surrounds Merc's new internal exhaust pipe and prevents noise from escaping through the sides of the drive shaft housing. This wall of water pressing against the inside of the housing also damps out mechanical vibration.

- Mercs have a new, non-broadcasting cowl that is isolated from engine operating sounds by large, soft-rubber mounts. The cowl actually "floats" around the powerhead. All openings for controls are sealed with neoprene to insure that sound is trapped inside the cowl.



Dyna-Float, aircraft-type suspension... an elastically isolated remote steering control arm... offset wrist pins... small-bore, short-stroke design... these are just a few more of the reasons why Mercs are 50% quieter.

While other manufacturers attempt to quiet their engines by padding in the sound, Mercury has engineered it *out* in 15 different ways, from the rubber floated cowl all the way down through the Jet-Prop exhaust. That's why you'll always get more RUN for your money with Mercury... 3.9, 6, 9.8, 20, 35, 50, 65, 90 and 100 hp.

MERCURY 

©1965, Kiekhaefer Corporation, Fond du Lac, Wisconsin and Toronto. Subsidiary of Brunswick Corp.

Saucy Shingle

(Continued from page 149)

bow piece where it ends in a long taper. Spring any scrap member around the inner surface of the frames past the transom to simulate the coaming. Note that it will be necessary to bevel the side of the transom and motorboards to accommodate this member. After this bevel is cut, the top frame member of the transom may be installed allowing $\frac{1}{2}$ in. clearance between the motorboards and coaming, and also providing the notch for the $\frac{3}{4}$ x $\frac{3}{4}$ -in. carling. The carling, set vertically, is fitted into the notch in the bow piece first and then sprung aft into the notches in each of the frames. Leave the end overhanging at the transom for trimming later. Fasten with $1\frac{1}{4}$ -in. nails into each of the frames and transom, after coating all of the contacting surfaces with glue.

STEP 9. Fair or bevel all surfaces which will contact the side decking so that the planking will fit flush to the framework. This is a progressive process that may seem rather complicated, but a study of the drawings and photographs should help clear up the matter. After fairing, the $\frac{1}{8}$ -in. plywood sheet is clamped to the side deck area so that the outline can be marked roughly. If you're careful, it's possible to obtain all of the decking from a single 4 x 8-ft. sheet. You won't have a great deal of excess material, however, so be careful in rough trimming. Next, the contact areas of the deck are coated liberally with glue and the side decking fastened around all the outer extremities with $\frac{3}{4}$ -in. nails spaced about 2 in. apart. It isn't necessary to fasten to any of the inner contact points. The opposite side is put on and any excess trimmed.

STEP 10. The coamings are cut from $\frac{1}{2}$ -in. mahogany and, preferably, rabbetted on the top edge to receive the decking. (If preferred, the decking may merely lap over the coaming with the routed groove being eliminated.) The coaming is fitted into the notch in the bow piece with the point extending over the top of this member. It is progressively sprung around the hull on the inside of the carling and frames and notched out on the aft end to fit over the transom and extend flush with the outer motorboard. In assembly, coat the contacting surfaces with glue and fasten with $1\frac{1}{4}$ -in. nails spaced about 6 in.

STEP 11. The dash beam and the forward deck beam at Frame 2 are fastened against blocking provided on the coaming. The dash beam must be bevelled on the bottom to contact the $\frac{1}{2}$ x 2-in. center bottom batten. At this point it rests against the frame and is canted forward

as indicated in the drawings. In assembly, use two $1\frac{1}{2}$ -in. No. 8 screws to fasten the dash beam at the contact point with Frame 1 and bottom batten.

STEP 12. The hull is now turned upside down and the $\frac{1}{2}$ x $1\frac{3}{4}$ -in. non-trip chine installed. A long bevel is cut so that this member will rest on the bow piece. Corner glue blocks are installed at the junctions of Frames 1 and 2 with the runner chines. The bottom area is then faired for both the runner chine and the runner bottom. (This operation is similar to fairing the frame for the decking.) The $\frac{1}{4}$ -in. anti-trip planking is fitted first. Cut it slightly oversize and do any necessary trimming after fastening it in place. After coating the area liberally with glue, begin fastening it along the bow piece. Then use a C-clamp to pull the non-trip chine so that the aft portion is parallel to the runner chine. This section must be flat. After pulling the chine down with the C-clamp, fasten it along the member with the $\frac{3}{4}$ -in. nails spaced about 2 in. apart. The area is then faired flush at the non-trip chine and the runner bottom planking installed, lapping it over the non-trip planking. It, too, is bedded in glue and nailed with $\frac{3}{4}$ -in. nails spaced about 2 in. apart.

STEP 13. Before finishing the forward decking, the interior should be painted with a dry-rot preventative. Cover as much of the area as possible, particularly down in the runners where water may tend to settle. The cowl plywood is fitted on one side of the coaming and tacked into position while the other side is fitted. The panel will tend to buckle as this is a slight compound curve, but as you progressively work the panel down the wrinkles will disappear. In fastening, again, use the $\frac{3}{4}$ -in. nails spaced about 2 in.

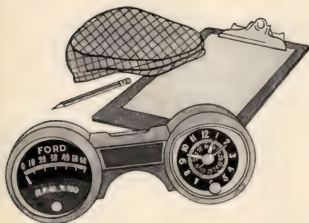
STEP 14. The transom knee may be cut from any scrap 2-in. material. The distance you mount this below the transom top edge should actually depend upon the motor used. The maximum is $5\frac{1}{2}$ in., but it's desirable to mount the knee as close to the top as the motor clamps will allow. Drive three 3-in. No. 14 screws through the rear of the transom into the knee and three $\frac{1}{2}$ -in. No. 8 screws through the coaming on either side. The cap strip at the dash covers the exposed edge of the forward decking. It should be cut from the scrap material from the coaming to extend $\frac{3}{4}$ in. above the decking. Round the edges generously and nail in place.

STEP 15. Due to the weight-sensitive nature of the three-point hydroplane, it is usually not fiberglassed. If you desire to fiberglass it, however, use a light cloth. In the prototype, the bottom was primed

(Please turn to page 208)

Who's got everything for your Ford

from Rally-Pacs...



A must for performance enthusiasts, this Mustang Rally-Pac is a unique, illuminated, twin-pod cluster with a 6,000 or 8,000-rpm tachometer and a precision electric clock. Has "camera case" finish. Mounts on steering column. \$79.95*

Floor Mats...

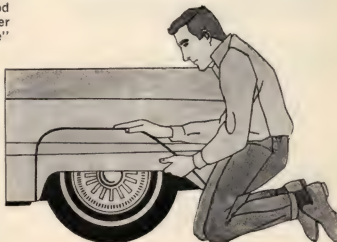


These durable floor mats come in two styles—contoured full-front and rear or twin 2-piece front and rear mats. Available in colors harmonized to your Ford's interior—rubber or vinyl. Fronts from \$7.95,* rears from \$3.80*



to Tri-Pacs

This kit can give your car that showroom look. Has car wash for 16 washes, an auto polish designed for all car finishes, a no-rub-chrome cleaner. \$2.99*



to Fender Shields

Here's a way to add to the fine styling of your Ford. These shields are easy to install, have a lock device. Available in gleaming stainless steel or primed for painting. From \$8.99*

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You'll get the most for your driving pleasure from your Ford Dealer

*Manufacturer's suggested retail prices. Installation charges, state or local taxes are extra.



HERE'S HOW LONE STAR CUSHIONS THE ROUGHEST RIDE



There are deep-v's and deep-v's . . . but only one Cushion-V, Lone Star's newest hull configuration just introduced in the 22-ft. fiberglass SOUTHWIND. It's the secret of sharp-turning, crisp-banking, high-speed performance. Six deep inverted lapstrakes that run from bow to stern on the bottom help lift the boat, deflect spray and add stability. V-angle under driver is 45°; at transom, 26° . . . a combination that delivers outstanding maneuverability with "kid glove" smoothness. Cushion-V hull (with FOAM-PAC flotation throughout) and 8-foot beam provide 65 square feet of deep cockpit space, the answer to the big water fisherman's prayer. Three large below-deck compartments total over 22 cubic feet of space; two of them double as ice chests. If big water is your bailiwick, don't miss the SOUTHWIND in inboard/outdrive options to 150 hp. now at your Lone Star dealer's. Write for color catalog of the "Funmakers," Lone Star's complete line of aluminum and fiberglass fishing boats, runabouts, cruisers and boat trailers.

Lone Star

LONE STAR BOAT COMPANY

Headquarters Plant: 1036 Industrial Ave. • Plano, Texas

Saucy Shingle

(Continued from page 206)

with a plywood sealer and then given three coats of marine varnish. The top side on the original was painted a brilliant red-orange. After sealing with the plywood primer, flat paint was applied and sanded until the grain had disappeared. Two coats of a marine enamel went on.

STEP 16. The steering should be a tiller rope type with the drum exposed or forward of the dash. These are available

BILL OF MATERIALS

Item	Material	No. Pcs.	Size
Bottom, Side & Runner Planking	DF PW Exterior AB	1	1/4"x4'x8'
Bow Lamination, Frame Gussets & Floorboards	DF PW Exterior AB	1	1/4"x4'x4'
Bow Piece No. 3, Dash Beam No. 7, Transom & motor boards	DF PW Exterior AB	1	1/2"x4'x4'
Decking & Cowling Cover	DF PW Exterior AB	1	1/8"x4'x8'
Bottom Battens	Spruce or Mahogany	3	1/2"x2'x6'
Anti-Trip Chine Frames	Spruce or Mahogany	2	1/2"x13/4"x4'6"
Cross Pawl at Frames 1 & 2	Spruce or Mahogany	2	3/4"x11/4"x4'
Transom Cap	Spruce or Mahogany	1	3/4"x13/4"x3'
Sheer Clamp & Corlings	Spruce or Mahogany	4	3/4"x3/4"x8'
Deck Batten	Spruce or Mahogany	1	1/2"x1"x4'
Coaming	Spruce or Mahogany	1	1/2"x7" (net) x 14' (make two)

GLUE: Resorcinol or Plastic Resin, Approx. 3 lbs.

FASTENINGS:

Nails: Ring-type boat nails, bronze or monel.

3/4" #14—1 lb., 1/4" #12—1/2 lb.

Screws: Flathead wood type, hot dipped galvanized iron.

1 1/2" #8—22 only, 3" #14—3 only

with a standard 15-in. wheel or a small 10-in. wheel. The tiller cable should lead through transom-type pulley sheaves recessed into the coaming, extend aft to a pulley on the bar mounted to the motor and then back down to the coaming where it joins the transom. A spring at this point maintains tension on the steering system at all times. A throttle control of the dead-man type or automatic release is recommended with larger motors, though a standard lever control can be used. To prevent slipping in turns, an aluminum fin is installed inboard of the port runner.

Saucy Shingle can handle almost any motor below 20 hp. You can get adequate speed for small fry with a motor under 10 hp., but the stock propeller should be replaced with one to match the boat. To achieve maximum performance it will also be necessary to adjust the height of the motor on the transom with "rev sticks"—1/4-in. pieces of wood slipped under the motor bracket one at a time. For high speeds it is recommended that the driver wear a life jacket and crash helmet. For the small fry it goes without saying that this equipment is a must at all times. ★ ★ ★



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Choosing the Perfect Prop

(Continued from page 136)

the readings. (Having a speedometer on board for these tests is important, because while the tachometer will tell you that a particular propeller is allowing the engine to run within its proper range, it won't tell you how efficiently.) Throttle back slowly to idle, let the boat come to rest and then repeat the process, this time noting how quickly the boat gets on plane and reaches top speed.

The first propeller you've tried will most likely be the one recommended by the factory for your boat and motor combination. It's a compromise selection picked for average performance over a wide range of uses to which you might put your boat; it's probably not ideal for any one of them. If the engine rpm did not reach the peak it registered with a test wheel, that means it's working too hard (lugging) and you'll next want to try a flatter pitch. In view of the fact that a flatter pitch implies getting closer to a work propeller, you may feel that this will cut your speed. Just the opposite will probably happen, for as the engine gets running closer to its peak rpm, it also is capable of more work and will push the boat faster.

Second Try May Hit Peak

With the flatter pitch prop, repeat your tests, noting once more the top speed, peak rpm reading, and how fast the boat gets up on plane. You may have hit the peak with this second try, or you may have to experiment with one or two other propellers, but we'll go on to the next step.

Take someone on board with you and repeat the test; then once more with two passengers. This is part of your "optional load," so keep these readings handy for future reference. With the extra load on board, your speed will probably decrease slightly and engine rpm will go down. You've reached the critical point in the tests, for the object has been to find the propeller that will permit your engine to turn at peak rpm with a light load while still turning within the recommended operating range when an extra load is added. Lower than recommended rpm at full throttle means possible engine damage and wasted fuel.

Once you've selected the propeller which will give you the top speed at the proper tachometer reading, experiment with your tilt pin setting. You may find that handling will be improved or that the boat will get up on plane faster. Although acceleration is usually a function of engine and propeller performance (note on the

(Please turn to page 212)

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Choosing the Perfect Prop

(Continued from page 210)

chart that one prop gave better acceleration while not achieving top speed as compared to its neighbor on the chart) your tilt pin settings are critical factors in achieving top performance.

For absolute top speed, you may want to experiment with "rev sticks." These are nothing but quarter-inch slats designed to raise the motor on the transom in small increments. In most cases, with a standard motor and transom, you won't have to get into this experiment, but here's the way if you want to try it.

The anti-cavitation plate on your motor's lower unit (the flat, horizontal fin just above the prop) should ride approximately parallel to the boat bottom just below the surface of the water when the boat is on plane. If it's too low, you're adding needless resistance and wasting fuel. If it's too high, your propeller will cavitate, over-spinning as air bubbles displace the water it should be pushing. This can damage the engine quickly and expensively, so keep a fast hand on the throttle as you experiment. Add one rev stick at a time until the prop just begins to cavitate. Then remove one stick and install transom through-bolts with the engine in the new position. You may want to replace the rev sticks with a single piece of wood, cut and finished to match the transom.

The importance of the prop in boat performance is best illustrated by an inventory of Columbian Bronze Corp., a propeller manufacturer whose activity in the outboard and outdrive field is confined to replacement props only. They stock more than two thousand varieties of props that vary in diameter, pitch, blade shape and number of blades (plus right-and-left handed props for twin installations). And they're not the only prop manufacturer.

So for better performance this year, plan a test session early in the season. It'll pay off in efficiency, economy and better boating. ★★★

Timer for Laser Pulses

A method has been developed whereby the duration of a laser light pulse may be varied from a few billionths to several thousandths of a second.

Laser light is highly directional and extremely bright. Its application can be found in such wide-ranging fields as communications, welding, ranging and tracking, and medicine. Westinghouse Defense and Space Center researchers expect the new development to render the laser still more versatile.



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New Outboard Fuel

(Continued from page 139)

the boat, Mielke was drawing the fuel as a vapor from the top of the tank, rather than as a liquid from the bottom. Although this eliminated the need for a converter on the engine, it created the first obvious problem—a power loss at full throttle.

Traveling to the engine as a vapor, not enough of the gas was available under full throttle. This caused the engine to run too lean. In all future installations, Mielke would prefer to use the more efficient liquid withdrawal system and utilize the converter that is standard on most LP gas fired engines. While today's marine safety codes prohibit the use of this system in boats, he's going ahead with tentative plans for such conversions in the hope that these regulations will be changed.

Engine Heat Offsets Cooling by Gas

The converter manufactured by Century is basically an expansion chamber that utilizes heat from the engine's water system to counteract the refrigeration effect of the evaporating gas. Most outboards run cool, using the water in which they're running. A warmer chamber will improve vaporization and allow a fatter charge to get to the carburetor. Homelite has incorporated a thermostat to raise jacket temperature to about 140°. To control fuel flow from the pressured tank to the regulator, a vacuum-actuated valve system adjusts flow to engine demand in the Century set-up.

The ignition advance curve will be modified. This modification depends on the peculiarities of the individual engine design, but generally begins with a greater advance in the lower rpm ranges and then tapers off more rapidly to the point where there is actually less advance in the higher ranges.

Exhaust valve seats were in rough shape when Mielke's engine was torn down, but this had been expected. Most engine conversions begin with the replacement of exhaust valve seats with a harder material, usually Stalite, and Mielke's next engines will incorporate this change. Because LP gas is dry and provides no lubricating action, the valves will be non-rotating to reduce wear.

Since LP gas, unlike gasoline, enters the manifold fully vaporized, the usual hot spot on the manifold will be eliminated so that a denser mixture is available for each intake stroke.

The standard Century LP gas carburetor performed well and will be used on the new engines. This carburetor features a combined system that uses a metering

valve and a throttle valve interconnected with a positive linkage. As the valves open, gas is admitted to the mixing chamber through orifices in a spraying on the downstream side of the throttle valve, assuring thorough mixing of fuel and air.

We asked Mielke why he was planning to convert all of the engines in his fleet to LP gas operation on the strength of only 155 hours of testing. His answer:

"My 155 hours was like the demonstration ride you take with a new car. You might find you want the seat changed, or stiffer shocks added, different tires put on, or even a different carburetor and manifold set-up hooked onto the engine. But, basically, all the engineering's been done. You're just tailoring what's available to fit your needs. I'm doing the same.

"I have to handle LP gas in bulk quantities for the stoves, refrigerators, heaters and lights on my boat, so I'm ready there. Tanks are available now for my operation that will allow me to pull vapor off the top for cooking and heating, and liquid off the bottom for the engine. They were available before, but I didn't have time to look for them for our experiment.

"Century has converted thousands of trucks, tractors, taxis and fleet passenger cars to LP gas operation and they know what they're doing. The equipment I'll get from them for my engines is thoroughly engineered, in production, and backed with a good parts system.

"Homelite has a good engine. It would have to be, because our conversion last summer broke a few basic rules and it still performed even better than I expected it to. They've been working on LP gas conversions for a long time—I don't think I was really the first to think of it for their outboard—and with my experiment and the dyno tests they've been running all winter, we've about passed the final exam.

Relieves Costs and Headaches

"Put all those factors together and you can see why I'm so confident. I've compared the cost of installation with the savings I'll achieve in fuel costs, oil, spark plugs, maintenance and aspirin and, for my business at least, it can't help but make sense."

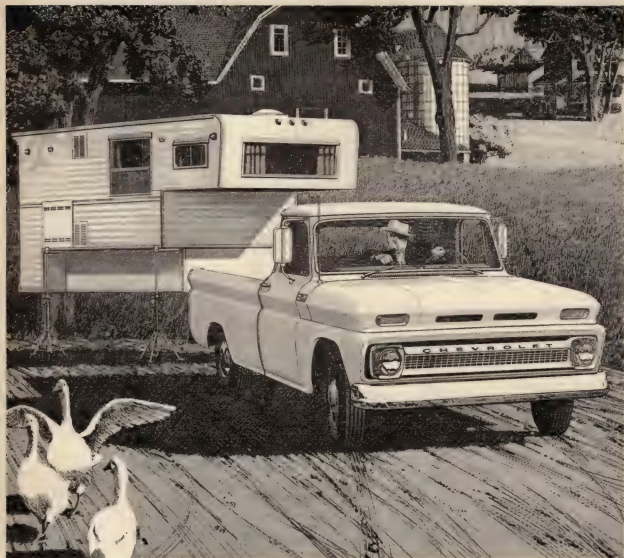
The safety factor in using LP gas is still a debatable point. The gas is not only colorless and highly flammable, but also heavier than air so any leakage would settle in the bilge of a conventional hull.

Mielke claims that statistics from the Interstate Commerce Commission show that LP has a better safety record than gasoline or diesel fuel. He also cites a Coast Guard regulation that allows LP

(Please turn to page 216)

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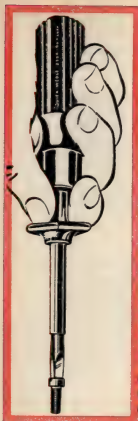
Soon this same truck will be loafing along toward some pleasure spot, loaded with a full cargo of campers and their gear. The Chevy Custom Camper comes factory-equipped for just such service with a Camper Option Package that contains the following items:

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wipers. ☐ Chromed front bumper, grille and hub caps for improved appearance. ☐ Foam-cushioned seat with nylon and vinyl upholstery. ☐ Custom Camper emblem on the cowl.

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New Outboard Fuel

(Continued from page 214)

operated fork lift trucks to work in the holds of cargo ships as an indication of the fuel's safety.

On the other hand, the National Fire Protection Assn. says in their standards governing marine LP gas appliances: "Only systems of the vapor withdrawal type are permitted. Containers designed or installed so as to admit liquid gas into any other part of the system are prohibited." And even with vapor withdrawal systems, the regulations covering installation are extremely strict.

The artist's conception on p. 137 illustrates one possible solution to the problem of how to install an LP gas fuel system in a conventional runabout. By locating the entire system in a well-vented false transom outside the hull, any leaking gas would be immediately dissipated overside.

Can Go for a Week

Mielke's customers like the LP conversion. With two of the big tanks on the back, they can go out for a week without having to worry about stopping, or finding the right fuel, and they like the clean exhaust that allows them to cruise downwind without being bothered by fumes.

"There's another reason why I'm pleased with the conversion and plan to do the whole fleet," Mielke says. "Since the four-cycle crankcase must be sealed to retain its limited amount of oil and because no oil goes through the engine and out the exhaust pipe, there's relatively little oil slick produced. This is important to me, not only because some of my customers swim in the river near where the fleet is moored but also, as a conservationist with an admittedly business-oriented attitude, I do not want to offend those who feel that any oil slick, no matter how slight, is detrimental to marine life. That has never been proved, but it's a case where avoidance of a possible problem makes sense."

There are limitations, at least for now, on applications best suited for LP outboards. Houseboats are a natural, as we've seen. Future development of the LP gas outboard hinges on a number of factors—changes in the NFPA standards mentioned above, development of a marine distribution system for the fuel, and most important, perfecting the whole system and putting it on the market. Homelite, the world's only manufacturer of four-cycle outboards, has no such marketing plans at present. However, they're following Mielke's experiment with great interest, and the situation could change in a hurry. Only time will tell. ★★★



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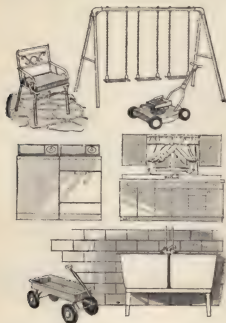
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Big-City Cabbies

(Continued from page 126)

lengths. One cynical driver explained: "Like that circus fella, Barnum, said, there's a sucker born every minute. Somebody always lets us back in."

What do cabbies say about speeding? Cops won't bother you in the city unless you're reckless, some say. It's too hard for them to clock you. But on highways, don't go faster than five mph over the limit. A cab driver will get a ticket "as fast as the next guy," all agreed.

One driver added: "Even more important than how fast you go is keeping up an even pace. It takes time to get back up to speed after hitting your brakes."

Once, after a flashy red convertible cut off a cab I was in, I asked the driver, "Are you ever tempted to get back at nuts like that?"

The driver, a white-haired old-timer, answered, "When you drive 150 miles a day in this kind of traffic, you'd become a rubber-room case if you got mad every time you got cut off. But we're only human. Sometimes people do get our goat."

As we inched ahead in the heavy traffic, the red convertible lurched back into the other lane, cutting off another car. Gradually we moved up until we were alongside. The cabby, a mischievous gleam in his eye, pointed to the right rear wheel of the convertible. "Hey, your tire's going flat!" he yelled.

The driver stared back stonily. "He didn't bite," I said sadly as we pulled ahead.

The oldster shook his head. "Give him a chance," he said. "It's eating him now. He figures I'm pulling a fast one, but he's not sure."

He Finally Bites

A couple of minutes later, he hollered, "Whoops, there he goes." I turned in time to see the convertible scoot over to the curb and the driver jump out to check the far-side tires. "He's really burning now," the cabby chuckled. "If you can't out-maneuver 'em, out-psych 'em."

From this, we went on to discuss other "road boors."

"Watch out for the character that noses into your parking space while you're waiting to back in," he said. "When I wait for someone to pull out of a space, I always wait behind him, not in front. That makes it easier for him to pull out too."

"Another thing to remember: When you park, cut your wheels into the curb, or some so-and-so will push you up to a hydrant or into a driveway to get his

(Please turn to page 220)



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By Quentin Reynolds

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Big-City Cabbies

(Continued from page 218)

car into your parking space."

I smiled at this misanthropic advice—until I remembered that it had happened to me a couple of times.

"And when you pull out of a space and there's no break in traffic, nose out as far as you can without clobbering someone," the driver went on. "This makes passing cars slow up and swing wide. Each time they give you extra room, grab it. Soon you'll stick out so far they'll have to let you through.

"You know," he continued, "that reminds me of a guy I knew who owned one of them little foreign puddle jumpers. He drove it into the city every day, and it was getting banged up something awful. Everybody would dent those little tinfoil bumpers, or jump over them and dent the bodywork. Everybody parks by ear in this town. So he typed up a couple dozen little cards saying something like 'I'm much smaller than you, please don't bump me when you pull out.' He put one on the car in front and one on the car behind. Nobody hits him anymore."

My funniest experience was in Los Angeles. We were stopped for a light, and a shiny new Cadillac with the inevitable cigar-puffing driver was jockeying for position inches away on our left, waiting to squeeze into our lane.

"Will you try to bluff him out?" I asked the cabby.

"We bluff only so far, and then we give in," he answered. "If we have too many accidents, no matter whose fault it is, we lose our jobs. But one trick usually works for me. Watch this."

As the light changed, the Caddy charged ahead. As it shot by, the cab driver gave its quarter panel a resounding slap with the flat of his hand. The cigar-puffer jammed on his brakes and jumped out to look at the "damage." Meanwhile, we pulled smoothly around and went on.

You just can't beat those cab drivers.

★★★

Africa Still Losing Arabia

Arabia, joined to West Africa twenty million years ago, is drifting away from the African continent at a rate of two centimeters each year, according to Dr. A. S. Laughton of the British National Institute of Oceanography.

Evidence shows that wadis (dry river beds) which start from the south coast of Arabia, continue in African Somaliland—and the Gulf of Aden now separating the two is becoming an ocean.

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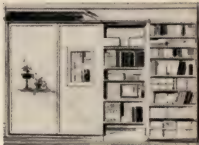
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18293 RIVERDALE AVE., PORT CHESTER, N.Y.

MARCH 1965

Keep Wheels from Falling Off

(Continued from page 179)

they're neglected and go bad, costs about \$22.50, and this doesn't take into consideration what could happen if a wheel comes off because a bearing's been neglected.

If you want to save the five bucks, moreover, you can do the job yourself—as long as you stick to the front wheels only. Rear wheel bearings should be left to a mechanic with the proper tools.

A typical front wheel bearing set-up is shown on page 174. Each wheel, as you can see, has two bearings—one in the outer part of the hub and the other toward the car. How you service them is shown in step-by-step photos on pages 176-7.

Each bearing has a cup (or outer race) to which it's mated. Most cups are press fitted into the hub and will not come out with the bearing. You can inspect them while they're in the wheel, by playing a light into the hub. If damaged, they can be removed by knocking them out with a drift and hammer, and new cups can be installed by tapping them in with a drift.

A Word of Caution

As they've been in operation, a bearing and its cup have become thoroughly and closely mated with each other. Neither will work as well as part of another assembly. For this reason, if a bearing needs to be replaced because of damage, replace its cup along with it, and vice versa. Buy them as a set, through your auto dealer's service department, or from an automotive parts supply outlet.

With the bearings removed, it's time for cleaning, inspecting and repacking. The first thing to note is the color and odor of the old grease. If it looks black or has an acrid smell to it, it's a dead giveaway that the bearing has been running hot. Either the grease was breaking down or the bearing wasn't properly adjusted. In any event, you can expect to find a damaged bearing or cup.

Try not to handle a bearing by its rollers or balls. Dirt and acid from your hands (in the form of perspiration) can harm these critical surfaces. Wash each bearing in a non-flammable bearing cleaning solvent, which you can buy in an auto parts outlet. Get off all the old grease.

If you have an air hose or tire pump available, you can dry the bearing with short, quick spurts of air. If not, let the bearing air dry on a clean sheet of paper. If you wish to quicken the drying action, carefully wipe off excess cleaner with a clean, lint-free rag.

After the bearing's been dried, dip it into a clean bucket of clean light engine

oil to provide it with some lubrication for inspecting. The two worst things for any bearing are dirt and lack of lubrication.

If the bearing is cracked or has pit-marks or pocks on it, get rid of it—and don't forget to replace its cup as well. Don't take chances—that "roller" has to go another 10,000 miles before you again look at it.

As part of your inspection, you should turn the bearing slowly, feeling for any binding effect caused by dirt or grit between the rollers. If a bind is felt, you can try rewashing the bearing, but chances are you'll end up replacing it.

If you find the surface of the bearing has turned slightly blue or straw colored, don't be too concerned—as long as there's no other evidence of damage. It doesn't mean the bearing has overheated. Discoloration of this sort can be caused by a chemical reaction of substances in the lubricant. However, if you can't be sure, don't take chances—it's best to replace the bearing.

Packing a Bearing

Whether you use the old bearings or replace with new, they should be greased. New bearings are lubricated at the factory, but you can never be sure that lubrication has been adequate.

To repack a bearing, use the high temperature bearing grease recommended on the lubrication chart for your car. You'll find this chart either in your owner's manual, or at a service station or new car dealer's. There are two popular types of wheel bearing lubricants, and either is suitable, but they must not be mixed. The two are not compatible and, if mixed, could break down under heat and leak past the grease retainer to the brakes. This action damages not only the bearings, but also the brake linings.

The two types of wheel bearing grease are a lithium type and one with a sodium base. The lithium grease is light in color, resembling petroleum jelly. The sodium type is dark green.

If you happen to own a bearing packer, use it. But you can do a good job by hand—a photo on page 177 shows how. Just make sure your hands are clean and dry.

Regarding that grease retainer you threw away, as I've pointed out, this is a good precaution to follow whenever you disassemble to get at the bearings. You never know if the retainer is damaged, so always replace it with a new one. By the way, if your setup calls for a leather-type grease retainer (most don't), soak it in light engine oil for about 15 minutes before installation to make it more pliable

(Please turn to page 224)

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Keep Wheels from Falling Off

(Continued from page 222)

and easier to install.

You're now ready to put everything back together again. But first, clean as much grease as possible from inside the hub and off the inside part of the spindle. You don't have to use solvent unless the grease is caked and hard to remove—just a clean, lint-free rag will do.

Though the inner bearing will fall into its cup easily, a metal grease retainer won't drop into place—it has to be knocked in. There are two ways of doing this, as shown at the top of page 178.

Before you install the wheel, hub and drum assembly back on the spindle, make sure you inspect the inside of the brake drum for any grease that may have gotten on it. *This is most important*, since that grease can be transferred to the brake linings. If any is there, clean it off with gasoline and let it dry before reassembling.

Putting the Wheel Back

In placing the wheel assembly back on the spindle, hold it so it's centered on the spindle to prevent the retainer and spindle from banging together and causing possible damage to these parts.

Slip the outer bearing onto the spindle and into its cup in the hub. Put back the washer and run up the adjusting nut. Now, you must adjust the bearings to the specifications for your car. The preferred way to do this job is with a torque wrench. You can do the job by "feel," but you're dealing with safety when you deal with bearings, so there should be no guesswork.

Generally, the adjusting procedure involves setting the bearings by first tightening to the specification for your car while spinning the wheel assembly by hand. The adjusting nut is then backed off and retightened for adjustment purposes to the correct specification.

Specifications for your car are not hard to find. Your local agency is usually glad to supply them. Or, you can go to most libraries and find automotive books, such as Motor's Auto Repair Manual, which give them. As a last resort, you can write to the manager of technical services of your car's manufacturer.

Keep in mind that it's important to get that adjusting nut just right—neither too tight nor too loose. If the nut's too loose, it could cause the bearings to become damaged by permitting them to bang against their cups. If bearings are adjusted too tight, too much stress can be placed on them and could lead to trouble.

Even if these things don't occur, a car

(Please turn to page 226)

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Keep Wheels from Falling Off

(Continued from page 224)

with improperly adjusted bearings lacks steering stability, has a tendency to shimmy and wander, and leads to abnormal tire wear.

With the adjusting nut properly in place, put the lock nut on the spindle. Install a new cotter pin and make sure its legs are spread wide—wrap them around the lock nut to be sure. Improper installation or failure to put on the cotter pin are other reasons for a wheel's working loose.

Finally, install the grease cap. It might be a good idea, though, to follow one maintenance trick used by many trucking garages. They coat the inside of the cap with some grease to keep water out of the front wheel bearings. Now you're ready to roll—with confidence.

Rear Bearings? Hands Off!

We said earlier that rear wheel bearings should not be tackled except by a mechanic with the proper tools. Fortunately, it's not necessary to treat them as often—only when there's evidence that they're bad. There are a few reasons for this.

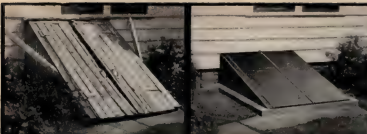
First, rear wheel bearings (one to each wheel) are tough to remove and usually require the use of a special rear-wheel bearing puller. You often have to remove the rear axle to get to the bearing.

Secondly, tests prove that the life of a rear wheel bearing is at least 50,000 miles and even greater. On many cars, lubricant from the rear end penetrates to the bearings, keeping them constantly greased.

Thirdly, if a rear wheel bearing does go bad you don't stand as much chance of losing control of the car as you would should a front wheel pop off.

This doesn't mean, of course, that if you suspect a rear wheel bearing is defective you should neglect it. You should have it removed, inspected and replaced. A bad rear bearing gives out with a rough growl or grating sound which continues with the car coasting and transmission in neutral. To test it positively and separate it from similar noises that could be created by a bad part in the rear, such as a bad pinion or differential bearing, jack up the rear wheels and spin them by hand. If you hear the noise while doing this, you'd best have the bearing looked at. ★★★

Albatrosses become as seaisack as any landlubber when they land aboard ships at sea. They waddle clumsily about deck, often unable to take off over the gunwales because of cramped space. Sailors call the larger albatrosses "gooney," or "goney," meaning dunce.



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World of Irradiated Miracles

(Continued from page 89)

the two chains. This, of course, happens at many points in the piece of plastic, to create an overall network of bonds. Radiation chemists call this "cross-linking."

That's the structural change that took place in the plastic in the impregnated wood. And it's the same kind of transformation that results in the plastic that has become a second skin for frozen turkeys and other birds. In addition to extraordinary toughness, this plastic has a quality known as "shrink memory."

Here's how that works. Polyethylene film is irradiated by a beam from an accelerator. It is then heated to the temperature at which the same plastic in *unirradiated* form would melt. The "cross linking" of molecules prevents the melting. But the plastic can be stretched to nearly any desired shape and size, then cooled under tension. Once cool, it remains at the larger size. When the plastic is to be used, it has only to be heated slightly above the unirradiated melting point and it obligingly tries to shrink back to its original size and shape. Thus it forms an air-tight, skin-tight fit around a turkey. In tubing form, it will pull itself tightly around the handles of tools and around wiring connectors to produce snugly fitting insulation that is moisture proof and heat resistant, which is one reason for its ready acceptance in the aerospace industry.

"Vintage" Bacon for Army

Radiation is an amazingly versatile tool. Though its use in some fields is still largely experimental, it has already proven itself an effective way to sterilize and pasteurize food, as a transplanted German scientist, Dr. Arno Brasch, demonstrated in the Brooklyn laboratory of the Electrotechnical Chemical Corp. he headed in the mid-1940s. Brasch used a capacitor. Radiation kills bacteria outright or slows their metabolism and reproductive rate.

The Army became interested in irradiated food in 1953—for the same reasons that Napoleon spurred development of canned goods 150 years ago. Modern efforts were made by irradiating ham, pork, chicken and beef, with the object of using them as rations that would need no refrigeration. They were sterilized in sealed plastic by means of high-dose radiation.

Since then soldiers have eaten sterilized bacon that has been on the shelf for two years and have found it highly palatable. Sterilized cooked hamburger at room temperature for a year reportedly looks, smells and tastes freshly-cooked.

Denmark, according to Dr. Kevin G.

Shea, chief of the AEC's processed foods section, may soon be exporting canned hams sterilized by radiation and heat.

Civilian needs are quite different from the military's. Limited preservation, or pasteurization—not sterilization—is of greatest commercial interest. The AEC has led the way in this area and reports especially good results with fruits and seafood.

The basic aim is to increase shelf life, with no loss of wholesomeness or good flavor. The storage life of fresh strawberries, for example, has been extended from about 10 days to two weeks. Oranges, cherries, pears and figs also last longer after irradiation. Lemons, on the other hand, pose a problem. They tend to become spongy and their vitamin-C content declines by about 50 percent.

Seafood Shows Promise

The AEC reports that irradiation has pushed the refrigerated shelf life of seafood up to 30 days or more. Shrimp, for example, has been kept fresh for 40 days (14-21 is usual); crab from 7 to 35 days; haddock from 12 to 30 days.

The AEC operates small food irradiators at a number of research sites. These devices essentially are deep tanks filled with water to shield operating personnel from radiation. The isotope source—cobalt 60—is placed at the bottom in two rectangular vertical plates that glow with an eerie blue light. Food in watertight containers is lowered between the plates.

Last fall the AEC dedicated a new marine-products laboratory in Gloucester, Mass., serving opening-day guests irradiated clams, haddock and lobster. A relatively large cobalt-60 device was installed there. Under construction are a pilot grain irradiator, a mobile truck unit for processing fruit at any distribution point, and small units for use aboard fishing vessels.

When will you be able to sample succulent 30-day-old clams or shrimp? Right now it's anybody's guess. The Food and Drug Administration has to approve all irradiated foods and, so far, has okayed sterilized bacon, the use of irradiation to kill insects in wheat and wheat products, and the pasteurization of potatoes to keep them from sprouting in storage.

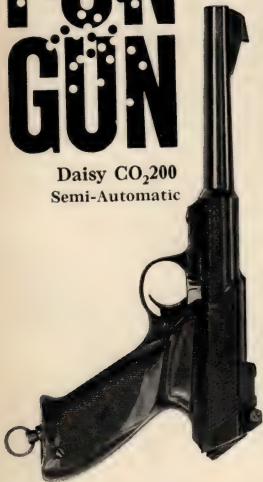
Of course, the Food and Drug agency has to move cautiously. But there's also a certain amount of unjustified public hesitancy. The fact is that such foods are as wholesome as foods processed by heat or freezing. The gamma rays tear right through the fish or fruit, explains Dr. Shea. The food most certainly is not "hot" or radioactive in any way.

Sterilization by irradiation is also used

(Please turn to page 230)

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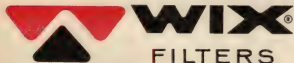
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World of Irradiated Miracles

(Continued from page 228)

by Ethicon, a subsidiary of Johnson & Johnson. Sutures are put in air-tight packets and then irradiated with a cobalt-60 source. The rays kill microorganisms in the sutures, which remain more pliable and about 15 percent stronger than those sterilized the old way (heat).

Another interesting product has been developed by scientists at the Esso Research and Engineering Company. By hitting a petroleum derivative with gamma rays, they triggered a chemical reaction that produced "sodium alkane sulfonate"—a new detergent that appears to be more easily broken down by bacteria than any other in existence.

Esso's product, say company officials, could go a long way toward solving the foam problem in rivers and sewage.

There are other interesting uses of irradiation, too. The Dow Chemical Company produces ethyl bromide, a clear, sweet-smelling liquid reagent used in the chemical industry. Gamma rays act as a catalyst in the reaction between hydrogen bromide and ethylene gas. The biggest advantage of this process over the previous one is that the product is now virtually 100 percent pure—not so before.

Quick-Cured Auto Paint

Electronized Chemicals Corporation, a subsidiary of High Voltage Engineering, radiates many different kinds of materials and devices, among them transistors. Radiation makes slight changes in the atomic structure of the transistors, enabling them to function faster.

The near future holds promise of even more interesting products and applications:

- Quick-curing of auto finishes, eliminating the need of heat and big ovens. It's reported that one of our car-makers is now testing an irradiation method that will produce a tougher, more indestructible color skin for your car.

- The grafting of one plastic to another. Polypropylene has much to recommend it as a textile fiber—it's strong, lightweight and cheap. But it doesn't hold dyes well and has such a low melting point that it sticks when ironed. Researchers recently succeeded in the radiation grafting of a second plastic to function as its outside surface. This provides a good dye site and heat resistance.

Add it all up—surgical supplies, plastic packaging, heat-shrinkable tubing, improved transistors, etc.—and you have an estimated \$100 million worth of products turned out last year. Not bad for an industry that's really just starting. ★★★



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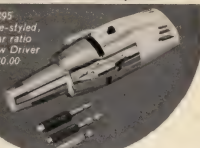
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Owner's Report—Oldsmobile

(Continued from page 99)

"Comfortable seats; I never tire when riding."—Arizona housewife.

"I am 6' 2" and I feel comfortable at the wheel."—Missouri real estate man.

Me, too. But have you tried to relax in back without jamming the front seat forward against the dash?

"Smooth acceleration from this Turbo Hydra-Matic transmission." — Virginia contractor.

"No chipping on the brushed bright metal dash."—Idaho laborer.

"Like the business-like dash."—Kentucky oil operator.

The clean brightwork has a no-nonsense look—until it kicks a slug of sun into your eyes.

"Effortless driving quality; it practically drives itself."—Virginia field engineer.

Erratic gas gages, rattles and squeaks, and a limited view out the back lead the next group of five complaints. Here are representative remarks by owners:

Gas gage is worthless, reads . . . 'Empty' after using 13 gallons from the 25-gallon tank"—Nebraska electronics engineer.

Gas gage needle swings as much as $\frac{1}{4}$ to $\frac{1}{2}$ a tank while driving."—Kentucky certified public accountant.

"We've had a few variations," Olds told PM, "but the warranty will get you a good replacement."

"Rattles like a log wagon."—Oklahoma professor.

"There's too much loss of rear view from wide rear supports of the top."—Utah transportation clerk.

You need an outside mirror, just as most cars do. But don't place it too low; some owners found reflected view blocked by the rear fender pickup.

"The two rear panels create large blind spots."—Massachusetts engineer.

"A big body but no room inside. Comfortable in front, very little legroom in back."—Pennsylvania machinist.

"Raised rear fenders and rear slope effect give a heavy, clumsy appearance, tooumpy and unbalanced."—Missouri auto mechanic.

Some owners figure this gives the car a ready-to-race look—so there you are.

Here are samples from the final five of the common praises owners listed:

LISTEN

to the sound of a Larson hull running

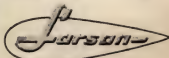


*Great boats come from careful hands,
a critical eye and a genius for subtle design.*

HEAR the air cushion effect of Paul Larson's "Million Bubble Ride" working when you run in a chop. The hull makes a "schuss-schuss" sound as waves are flattened . . . Millions of bubbles are trapped under the lapline hull . . . they compress and roll back from bow to stern.

FEEL the smoothness, speed and stability of this unique boat hull, the product of 51 years of experience.

LOOK at Larson's reasonable price tag for a fiberglass 16' All American with complementary color convertible top set and 18 gal. gas tank and dash gauge—\$1145 (without engine—FOB plant)



LARSON BOAT WORKS, INC.
LITTLE FALLS, MINN. / NASHVILLE, GA.

"With plenty of room to move about, trips are less tiresome than they were in my '60 Olds."—Alabama general contractor.

"Like the front end shape."—Kentucky furniture store manager.

"Excellent instrument arrangement with large, graduated fuel gage."—Louisiana oil field roughneck.

"It's heavy and holds the road, a smooth running automobile."—New Jersey construction foreman.

"Mechanical reliability is the outstanding feature. My repair bills are practically non-existent."—Kansas attorney.

That's what makes horse races.

There are a few sour notes left in the Olds symphony. Transmission and carburetor trouble lead these last five complaints.

"After 2000 miles across country, transmission burned out. Dealer thought tight adjustment at factory kept oil from rear plates."—Utah bank trust officer.

"Don't seem able to get carburetor adjusted."—Retired Alabama salesman.

Olds owners aren't alone here. Carb adjustment seems to be joining music box making as a lost art.

"I would like about two inches more headroom."—Tennessee pipefitter.

"At around 70 mph, it has a slight tendency to wander. Seems that the front end tries to get out of the way so that the back end can pass."—Kentucky civil servant.

Anyone planning a trip on Kentucky roads better watch out for this guy.

"The car needs side molding located to protect the paint from other people's doors."—Wisconsin police officer.

There you have it—the report on the '65 Olds from the test drivers who know it best, the owners themselves. ★★

Radio-Controlled Watchdogs

British police dogs will soon be controlled by their masters' voices, broadcast to them by radio. Special radio equipment to be worn by patrol dogs is being developed at the Royal Aircraft Establishment at Farnborough, England.

In addition to their usual security work, the dogs of the Ministry of Aviation Dog Training School have already played an important role in crash investigations by their recovery of small fragments of accident debris. Attaching "bleep" radio transmitters to the dogs, allowing them to be tracked by one man throughout their solo security patrols, is foreseen as a future development.

MARCH 1965

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1500-1 GEAR HEAD MOTOR
Speed 6 RPM @ 24 V.D.C. Reversible. 5 AMPs. Also runs well on 12 V.D.C. on reduced power. Excellent for small drive unit for small winch, toy cars, capstan, etc. Has 3/8" drive shaft. Shpg. Wt. 7 lbs. Like new. Tested prior to shipment. Approx. GOV'T COST \$97.50. Just **\$12.95**



12V RETRACTABLE LIGHT Contains 8" seal beam light. 250 watts. Self-contained 12V retract motor drives light mechanism from 0° to 90°. Excellent for trucks, trailers, construction, hunting, etc. Shpg. wt. 9 lbs. NEW. Approx. GOV'T COST \$65. Only **\$9.95**.

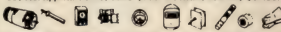


HEAVY DUTY MAGNET Fantastic power, will pull 125 lbs. on steel. Excellent as underwater retriever. Picks up all ferrous metals. Dims. 4" x 2" x 1 3/4". **\$7.95**.



175 AMP D.C. WELDER burns 1 1/2" to 3 1/8" rod at 24 to 43 V. Ideal for farm, workshop, etc. Can also be used as an AC power source. Complete unit consists of new 9 h.p. H & S engine. All ball bearing construction. Direct coupled to 175 AMP Gen. Portable wheeled frame. Control rheostat and tractor hook. 1 yr. factory warranty on defects of parts, and workmanship. Shipping weight 200 lbs. A \$450 value **\$199.50**

DC JET GENERATOR ARC WELDING KIT Complete with GE Type CM-77 Generator (30 volts D.C., 400 Amp., 3000 RPM) sp. ampere rating is for continuous duty. Interchangeable amperage is 500 to 600 amps., also 2 rheostats, 1 voltage reg., 1 voltmeter, 1 electrode holder, 1 welder's mask, 1 toggle switch, 10 lb. vacuum packed 1/4 in. welding rods, pair welder's gloves & spiline coupling. All units guaranteed pre-tested. Wt. 110 lbs. Approx. GOV'T. COST \$700. All items, now only **\$64.50**.



ELECTRIC STORAGE BATTERY
WINCH For use on 12 V. D. C. Heavy-duty ball bearing construction, 160-1 gear reduction. Reversible spool will handle 80' of 1/4" cable. 2000 lb capacity. Ready to install & operate. 10" x 9" w. x 8" h. Excellent for Jeeps, trucks, boats, etc. Complete with mounting bracket, shpg. wt. 60 lbs. Approx. Gov't cost \$400. New. Model E. 90-day guarantee. Special **\$56.50**. Plus \$3.39 Fed Tax.



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Owner's Report—Dodge

(Continued from page 94)

riors brought praises from the next set of owners. Here are samples of the most popular remarks, numbers six through ten:

"The upholstery is finished off so neatly."—Colorado electronic technician.

"The interior fabrics are durable."—Maryland maintenance supervisor.

"It seats you so you look down on the hood and dash, not out from behind them."

—Arkansas laboratory technician.

"The style of the body makes parking very easy."—Vermont teacher.

"I like the layout of the dash. Several of the knobs have a dual purpose and everything is handy."—Pennsylvania machine operator.

"I like the appearance and the ease of reading various instruments."—Nebraska salesman.

But reading the horizontal speedometer accurately between 50 and 70 takes a hawk-sharp eye.

"Plenty of headroom for the 'tall ones'".—Oklahoma retiree.

"Lots of legroom. Doors are wide so it is easy for a six-footer to get in and out."

—Kentucky salesman.

"The 440 has the appearance of a larger car and a family of six does not have problems riding in it."—Maryland painter-decorator.

Thoughtless location of ashtray and lighter, poor bumpers, and wind noise are among the next crop of disappointing Dodge characteristics. Here are owners' comments illustrating numbers six through ten:

"The front ashtray is too close to the dash to put out a cigarette in it."—Oklahoma insurance agent.

"The cigarette lighter is hidden in the dashboard. You'll scrape your knuckles getting it out."—North Carolina retail supervisor.

With knuckles bleeding, the auto editor agrees heartily. When is someone in Detroit going to design a decent dash ashtray?

"Lacks bumper protection. The rear end is too easily damaged."—Tennessee accountant.

"Not enough protection in front and back to prevent other cars from damaging your fenders. My chrome is cracked already."—Pennsylvania teacher.

"I would like to know someday to eliminate this wind noise."—South Carolina field worker.

"The wind whistles in around the top of the front windows."—Virginia communications engineer.

"The chrome strip along the sides is

(Please turn to page 236)

SURPLUS SALE

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EXCESS INVENTORY
BANKRUPT STOCK



400-AMPERE WELDER
• Item #156. Heavy duty. Ready to use. Built-in blower, reluctance, current control, pulley, etc.
• Drive with gas engine, tractor, etc. Will handle heaviest work. Wt. 100 lbs. Gov't Cost Over \$400.
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• Item #920-A. 12-volt motor driven 1000 PSI pump. Use for snow plow and cultivator lifts, hydraulic presses, etc. Size 15"x17"x6". Wt. 24 lbs. Gov't Cost \$170. Sale...
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50-AMPERE DC GENERATOR

• Item #1X07. Expensive ball bearing DC generator. Will furnish 50-amps. at 12 volts. Many applications. Size 7"x11". Wt. 25 lbs. Gov't Cost \$151. Sale...
\$11.90

BATTERY WORM GEAR WINCH

• Item #321. Powerful (2000 lb.) 12-volt, ball bearing, battery winch. Excellent for auto wreckers, farms, trucks, tractors, boats, etc. Holds load any position. Holds 80 ft. 1/2" cable. • Size 19"x15"x8". Wt. 64 lbs. \$84.50 Gov't Cost \$275. Sale...



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• \$105. Transfer switch, 300-a. 110V. \$ 28.71
• \$ 60. Air-Vacuum Unit, Delco, 12-v. \$ 17.95
• \$ 48. Surveying Level with Tripod. \$ 27.95
• \$ 29. City Dial Telephone, W.E. \$ 7.95
• \$ 35. Electric Timer Switch, 115-v. \$ 8.91
• \$ 11. Fish-Worm, Shocker. \$ 3.98

30-1 WORM GEAR REDUCER

• Item #1317. Leading make, ball bearing worm drive unit. Use for grain augers, band saws, drill presses, etc.
• Ratio 30 to 1. 1/2 h.p. Size 6"x7"x7". Wt. 22 lbs. Gov't Cost \$79.00. Sale...
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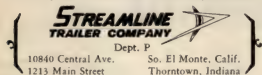
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COMP-TOOL, Inc.
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Owner's Report—Dodge

(Continued from page 234)

up too high. It should be across the center of the body and doors to protect them from being struck, scarred and scratched by doors of cars parked alongside."—retired Alabamian.

He's right. The sheet metal bulges out beyond the protection of the molding.

"The chrome strip is a dirt catcher."—Pennsylvania foundry layout man.

"The four-speed manual transmission will not shift smoothly back into first and second. And if you shift fast, the body bounces on the rear end. I have heavy duty shocks but it doesn't help much."—Pennsylvania maintenance man.

"Torque-Flite shifts hard into second and high gear."—Colorado Air Force master sergeant.

Reports saluting Dodge brakes and warranty lead the list of widespread praises. Here are numbers 11 through 15:

"Stops are comfortable even when I have to stop fast."—Arizona electrician.

"The brakes are excellent."—South Carolina engineer.

In six hard stops from 60, the required pedal pressure increased gradually to only 50 percent above first-stop requirements. We'd call that calm and collected braking.

"You can't beat the five-year or 50,000-miles warranty."—Tennessee salesman.

"I've gotten excellent service from Chrysler products with minimum expense and trouble."—South Carolina real estate man.

"Chrysler products stand up, for me, better with less maintenance cost."—Oklahoma Air Force officer.

With critical parts covered by a long warranty, the factory is inspired these days to exercise special care in building the car.

"I don't think there's a car with a smoother transmission. You can hardly tell when it changes speed."—Nebraska restaurant worker.

Grille styling and dash panel prompt the leaders among the last five complaints. And although Dodge has whittled idiot lights down just to the oil pressure indicator, owners won't let up—some want a gage there, too. Here's the final list:

"Would like to see grille changed to correct its drooping appearance from the front."—South Dakota court officer.

"I prefer the horizontal lines of my '61 Lancer's grille to the vertical lines on the Coronet's."—Retired Washingtonian.

"Dash panel poorly engineered; bright light indicator impossible to see when sitting erect; can't read various control knobs at night."—Pennsylvania salesman.

The car's interior is handsomely lighted, but Dodge could have done a better job on the instruments.

"The dash, although handsome, is made of a great deal of coated plastic. I have my doubts as to its future wear."—Pennsylvania teacher.

"There should be an oil gage. I watch the instruments closely."—Nebraska electronics instructor.

"Hood ornament is ugly; body style too wide in front."—Arkansas school librarian.

"The power steering is oversensitive."—Massachusetts purchasing director.

The power comes on, in Chrysler products, as soon as you start turning. It can seem nervous until you're used to it.

There you have the reactions, both enthusiastic and disappointed, by '65 Dodge owners from across the country. ★★

Fish Eat Weeds, Save Power

Baby grass carp—14 tons of them—make gluttons of themselves to keep lights burning in England. By thriving on fast-growing weeds in the Cavendish Dock, which supplies water to the cooling system of the electric power station at Barrow-in-Furness, the two-inch fish free the clogged intakes, keep water flowing.

The carp were flown in from Hong Kong in water-filled plastic bags packed in a heated box and then put in a 3,000 gallon fresh-water tank (gradually made as salty as the dock water). A few weed-hungry London Zoo carp prompted the Central Electricity Generating Board to order the fish. Eventually, the babies will munch their way to 70-pound adults. One problem remains: do these fish breed in England? If not, the whole operation may have to be repeated in a few years.



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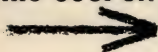
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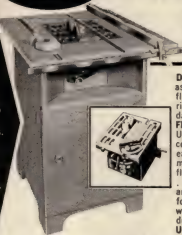
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Includes completely assembled cast iron and steel 8" tilt arbor power saw with ground cast iron table... less blade. If desired, RIP FENCE for easier work alignment, \$3.50 additional



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FREE CABINET BASE PLANS Use as portable bench saw as received (inset photo)... or transform easily and inexpensively into floor model (as shown) guar. to do work of floor models costing \$300. **FREE** plans... sheet of 1/4" plywood and 3-4 hours are all you'll need. Use your AMCO saw for cutting. Plans provide 27" x 24" work surface, 33" height, pullout sawdust bin, tool storage compartment.
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f.o.b. factory

Optional Faceplate for turning bowls, trays, lamp bases, rosettes, etc. \$2.50



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UNCONDITIONAL 10-YEAR GUARANTEE.

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f.o.b. factory Wt. 15 lbs.

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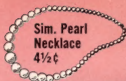
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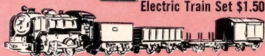


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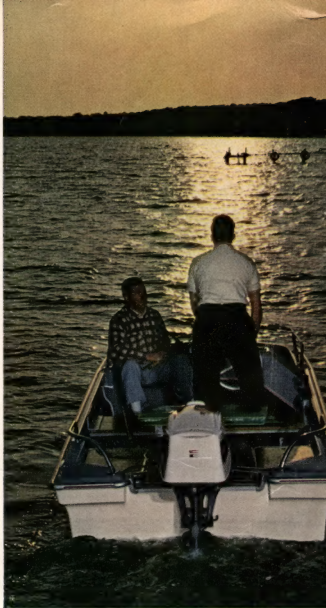
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